

Clinical Photography in Dentistry

Matrishva B Vyas

Foreword

Akhter Husain



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*I dedicate this book as a tribute to
my parents
Principal Bhaskar Vyas and Chandrika B Vyas
whose many sacrifices in life made my education possible*



Clinical photography has become an integral part of any present day clinical set up. The whole gamut of advantages includes patient education, teaching, research publications and general record maintenance. It also helps in visualization of changes and evaluation of progress of treatment, besides recording evidence for legal protection.

However, clinicians may not always have the services of a professional photographer available all the time. With a little effort doctors can take their own clinical photographs with acceptable and at times astounding results. But the intricacies of taking or making of a photo has been a deterrent to many clinicians.

This book authored by Dr. Matrishva B Vyas aims at providing the doctor an insight into the simplified principles of clinical photography and necessary paraphernalia required for the same.

With the advent of digital technology, it has now become simple and easy to understand and learn photography.

I am sure this book will be of great help to the students of dentistry as well as the clinicians and go a long way in fulfilling the void in this less attended area.

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Preface

It is always confusing for a beginner to know and understand where he should begin his endeavour with photography. I am sure many students and practitioners of dentistry will associate themselves with this book because everyone passes through the same stage. I know this as I once had the same confusing experience.

Photography is the foremost amongst the basic tools that enables a clinician to synthesize relevant information pertaining to the patient. This information, in turn, helps develop the time honored skill of properly diagnosing and planning the treatment. Photography, in this sense, is a useful weapon in the armory of accurate diagnosis.

The need for photography has been recognized in dentistry for more than a century. But, methods for successful shooting of photograph were so complicated and difficult that many practitioners refrained themselves from it. However with the advancement of technology in photography industry and the advent of digital era, complexities and difficulties have been reduced to a great extent. Hence, today it is possible to shoot clinical photographs successfully with basic equipment.

With the changing character of dental practice, the increasing need to maintain records and their necessity for communication, as a practice builder, a publication tool and to protect themselves from medicolegal complexities, many clinicians are turning to learn and acquire better knowledge of photography. In their pursuit to do so, many attend short courses on photography and get practical training. Many periodicals and books on photography are available in abundance for beginners. However, it should be noted that these courses, periodicals and books contain scattered information and show great variability in length. A clinician may sometimes find them very vast, irrelevant and confusing.

Therefore, specific and relevant information required for the clinical conditions needs to be imparted in a comprehensive yet concise manner for clinical photography. This encouraged me to write this book. In this book I have attempted to explain the intricacies of photography in a summarized and digestible format for dental professionals.

After going through this book, one will realise that clinical photography can be done with less chair-side time, a few equipments and minimal discomfort to the patient.

The book consists of 10 chapters. The first chapter exposes reader to the world of photography and highlights the need of photography in dental profession.

Next three chapters (chapter 2 through chapter 4) explain the technicalities involved in photography. It will help one choose right cameras, lenses and other accessories for clinical photography. It also

will guide one in setting up camera before starting a journey to clinical photography. The reader will also learn the finer details of perfect exposure, use of light, shutter speed and aperture for 'creating' a photograph.

Chapter 5 through chapter 8, deals with practical aspects of taking photographs in a given clinical situation. Suggestions and guidelines are made for different protocols recommended by various boards to train the reader how to shoot clinical photographs effectively. It will also teach the intricacies of table-top photography, and photographing radiographs. In addition, chapter 8 deals with silhouette photography, an often neglected, yet very useful topic.

Chapter 9 on *Storage and Care* should be read, understood and applied for safety and longevity of inventory.

Chapter 10 teaches one how to display, store and present pictures. It also deals with ethical aspect of photography applicable to dental profession.

Some readers may neglect the earlier chapters that comprise technicalities on photography, believing it safe to read only the chapters concentrating on practical aspects. However, I must clarify that photography is both an art as well as science, and without technical knowledge the results will be certainly below the standards. So it is necessary to have a thorough grounding of the basics in order to achieve quality results.

This book is a maiden and modest attempt to provide relevant information on clinical photography in a logical format that will help students as well as clinicians to understand and apply the basics of photography, while taking photographs of their patients.

Matrishva B Vyas



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Photography has become an integral part of our daily life. Today, photography is omnipresent in every sphere of human activity right from research work to entertainment and from documentation to creating stunning pictorial work of art.

With reference to medicine and dentistry, photography plays a vital role, not only in academics but also in clinical practice.

In clinical practice, it serves many important purposes. First and foremost it allows one to document patient's condition pre, post and during treatment. By taking pictures we are creating a visual record that will be helpful in clinical presentations and will tell fascinating story of progress in treatment. Photography, in this sense, is a very strong means of communication, a vehicle for expressing ideas. Photographic documentation of treated cases is a must for passing masters degree in many branches of dentistry. It also helps in clinical settings as a prominent marketing tool.

In scientific conventions, those people are in limelight who have clinical photographic records. For want of it others are just the audience.

Photography also makes one more observant and receptive to what is going on in the treatment of a particular patient. *The simple act of taking picture forces you to look more closely at the clinical condition. You begin to see things that other clinicians miss because they are blinded by familiarity, and this leads to greater appreciation of the clinical situation.* It has been observed that those who maintain clinical and photographic records are the ones who are disciplined in their clinical approach.

Not only maintenance of record will make you disciplined but also it will act as a self improvement tool. You learn from your past records, which will make a better clinician of you.

The term *photography* literally means photo = light and graphy = creation / painting, i.e. painting with light or creation with light.

As early as 350 BC, Aristotle knew that light passing through a tiny hole, could produce an inverted image. Centuries later, it was discovered that the same light, if passed through a lens, a brighter and sharper image could be produced. This principle was developed into the foundation of 'camera obscura' and subsequently the camera itself.

For the first time Daguerre, a Frenchman, publicly unveiled the first camera of world in Paris in 1839. Photography that time was an elite affair. The amazing advancement since then in camera, lens and film production has made photography, a much easier and more accessible than ever.

You can take perfectly exposed and pin-sharp pictures with no prior experience—just point and shoot. But photography as an art is more than that. Photography beyond the realms of the snapshot requires skill (**Figs 1.1 and 1.2**).



Fig. 1.1



Fig. 1.2

Figs 1.1 and 1.2: Once you have mastered the basics of photography, it will be possible to take successful pictures of any subject

Technology, in spite of its advances, is yet to harness the artistic side of photography. Cameras cannot tell you what to photograph, or how to compose a picture. Neither can it tell you when to trip the shutter to capture a person's character on film.

This is where this book comes in. It will be taking you through all aspects of photography, from choosing a camera and lenses and mastering the intricacies of exposure and depth of field, to the importance of light, using flash and composing a picture.

This book is an essential reading for enthusiast medical and dental practitioners and students, who like to gain a complete grounding on photographic technique, develop the ability to judge what makes a successful shot and achieve quality results with their pictures again and again.

The emphasis in this book is on how to become a good clinical photographer through hands on experience. The freedom of knowing, that most of your photographs will turn out satisfactorily – can only be gained by practising the basic skills until they become habitual.

Going through this book, you will be mastering the practical side and at the same time also would develop your visual sense—an awareness of why you are taking a particular picture. Without this sense of purpose, the result is likely to be dull, no matter how technically correct one is.

2

Armamentarium

CAMERA

The most difficult part of photography for a beginner is actually deciding which type of camera to buy. Each manufacturer claims his model is the best and has more features than the rest and so on.

Regardless of the brand you chose, familiarity and practice with your camera system will eventually produce good results. At the end of the day, one must remember that camera is only as good as a person using it. Cameras only deal with the mechanical side of photography; they cannot compose pictures, choose subject or tell when the light is right. Those decisions will always have to be made by you, and they are, by far, the most important points.

It is important to remember that you will 'waste' lot of shots to get accustomed to your camera. Upgrading equipment or changing systems is an expensive proposition. Getting the right stuff early in your career will save money in the long run. This finally will allow you to concentrate on technique and not worry about the adequacy of your equipment.

Let us now, go one by one to different types of cameras available in the market.

COMPACT CAMERAS

Also referred to as consumer cameras or point and shoot cameras. These cameras are very popular for two main reasons. Firstly, they are small, light and easy to carry around. Secondly, they are a doodle to use because everything from exposure to focusing is automatic. In addition, they are less expensive. This makes them ideal for holidays, picnics and parties (**Fig. 2.1**).

There are basically three types of compact cameras available: (i) Fixed lens, (ii) dual lens; and (iii) zoom compact.

Fixed lens are the simplest and cheapest. They have slightly wide angle lens, typically with the focal length of around 35 mm. Unfortunately, it is too wide to give flattering results, and in any case it will not focus close enough.



Fig. 2.1: Compact zoom camera

Dual, or twin lens, offers the same lens but at the flick you have the option of using a standard focal length of 45–50 mm. This increases your options, though it is still not ideal for close-ups.

Finally, *zoom compacts* offers the greatest flexibility of all. The focal length range can be anything from 35–115 mm, which means you can shoot a much broader range of subjects and compose picture with greater precision.

The main drawback with compacts is, they give very limited control. Focusing, exposure and film speed are set automatically, and often you cannot override the camera when you want to change the exposure, or try certain techniques. You are also stuck with the lens the camera comes with.

This is fine if you want to take snapshots at a picnic to record family and friends, but in clinical photography where you wish to exercise greater control over the picture taking process, you need a camera which will behave as per your commands. You must have the right camera if you wish to convey the message with your clinical photographs. So, what is this right camera?

It must, be able to shoot in fully manual and fully autofocus modes if you wish to pursue photography at any level. So, what does that mean? It leaves out any analogue/digital point and shoot cameras available in the market right now!

Many people think that photography is just pointing a camera and taking a photo. Unfortunately, it is not that simple.

To tell a story through the medium of frame with four walls is an art, and to pursue this art one has to have a 'single lens reflex' (SLR) camera. It may be a film or a digital version. Invest in a good SLR camera and you are ready for quality results.



Fig. 2.2A: SLR camera

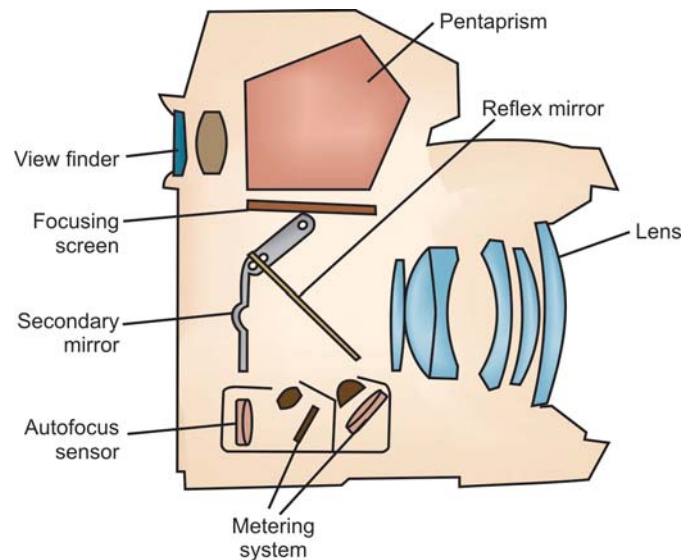


Fig. 2.2B: Internal assembly of SLR camera

SINGLE LENS REFLEX (SLR) CAMERA

Single lens reflex (SLR) is the perfect camera for all-round photography. It gives you the scope to take control over every aspect of the picture taking process when you feel it is necessary, but will happily make all the decisions for you when there is no time to think.



Figs 2.3A to C: SLR camera gives the scope to take complete control over picture taking process

The single lens in SLR refers to the fact that it is using a single lens for capturing images and displaying on viewfinder. The reflex part refers to the use of a reflex mirror which reflects the image passing through the lens towards the viewfinder. This mechanism allows you to see exactly what will be captured by the film or sensor without parallax or distortion (**Figs 2.2 and 2.3**).

FORMAT

The main factor that differentiates cameras is the size of film they accept. The most common film format in use is 35 mm found in both compact and SLR cameras. Another, film format known as advanced photo system (APS) is developed recently. It makes picture taking quicker and easier than ever before. The main difference between APS and 35 mm is that the APS format is smaller. From a positive point it means that the cameras are smaller. But smaller film means a drop in image quality. Although this factor should not worry a clinician much as the photographs needs no enlargement more than 4 × 6 inches in most of the cases.

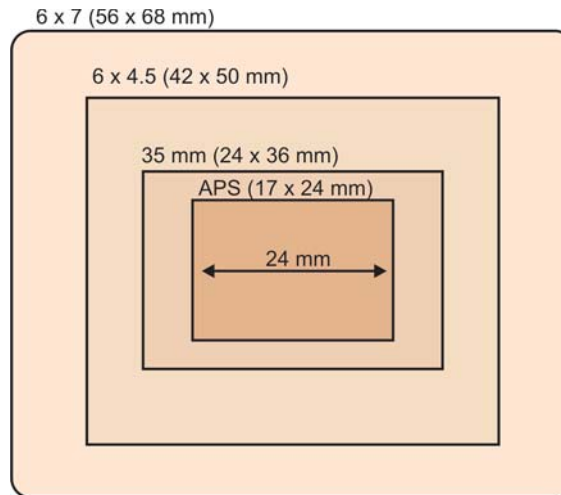


Fig. 2.4: Relative size of different film formats

Other formats available are 6×4.5 cm and 6×7 cm which are for professional use in photography industry for enlargement of print to an enormous size (**Fig. 2.4**).

Coming to the debate between film (analogue) and digital cameras, which one to choose? None is inferior as far as quality is concerned. In certain areas each has its advantages over the other. But having said that, we must remember today, digitization is catching up and film cameras are becoming soon out of market. Let us see certain advantages and disadvantages of digital camera over its predecessor, i.e. analogue camera.

Advantages of Digital

- Immediate gratification: This aspect is very rewarding and reassuring. You are able to instantly look at a histogram, verify your exposure, recheck your composition, etc.
- You have the ability to immediately show it to your patient (A big marketing tool). (Students in orthodontics can show the effect of 'VTO' for their myofunctional appliance cases.)
- Instant ISO/white balance changes from shot to shot (You have to shoot complete roll only in one ISO settings in analogue camera).
- Digital media is more portable. Hundreds of photographs could be carried in one small memory card.
- CF cards are not subject to damage from X-rays while films do (This is important while you have security check at airports).
- It is easier to store digital images (Less storage space required).
- There is no film or processing cost.

- CF cards do not need to be refrigerated (Films, if to be stored for long-time needs refrigeration).
- Unlimited perfect copies can be made from the original. If you store the image in loss-less format then there is no image degradation each time you make a copy (Film has got this disadvantage).
- Eco-friendly: Digital is less harmful to the environment. Film processing is a dirty business. Chemicals involved are very toxic and obviously bad for the environment.

Digital has its own disadvantages as well:

- Higher initial cost.
- Digital requires higher battery consumption.
- Poor low light performance (Digital performs poorly in low light situation than their film counterparts).
- Potential equipment failure (Memory card may crash or the hard drive may become corrupted).
- Digital has a steeper learning curve (In addition to photography, you need to learn computers).
- More frequent attrition. In comparison to prices they become cheaper and cheaper day-by-day. At the same time newer innovations and improved versions make your camera obsolete much quicker.

Having discussed the advantages and disadvantages of digital camera, it needs to be ascertained that it makes sense to investigate digital as an alternative medium. It definitely makes life easier.

Then comes the next question, what to see in a SLR camera before purchasing it. SLR camera should have following features:

1. Basic exposure modes (program, aperture, shutter and manual mode)
2. Battery supply ('AA' is the most preferred)
3. Motor drive
4. Mirror lock-up
5. Depth of field preview
6. Vertical and cable release (Both features)
7. Exposure compensation (1/3 or ½ stops)
8. Higher flash synchronization (at least 1/250 sec.)
9. Autofocus
10. Light meter

LENS

Buying an SLR camera is an exciting moment, you become impatient to get it home, load some film/memory card and start taking pictures. But soon you realize that in order to photograph a wide range of subjects you need more than just the lens, that a camera comes with.

The burning question is what type of lens to be purchased? With so many lenses available in the market today, making that decision is a real brain drain.

Probably the most important part of photography is the lens. Lens is the eye of SLR camera. You may have SLR camera of any make, may it be manual or autofocus, analogue or digital, the



Figs 2.5A and B: Lenses are categorized according to their focal length

quality of the captured image essentially depends on the quality of lens that you are using. It is very important to select a proper lens.

Depending on the focal length, (focal length refers to a lens's magnification power and is measured in millimeters) lens could be divided into (**Figs 2.5A to 2.7**).

- Fish eye (minimum focal length)
- Ultra-wide angle
- Wide angle
- Normal (35-70 mm)

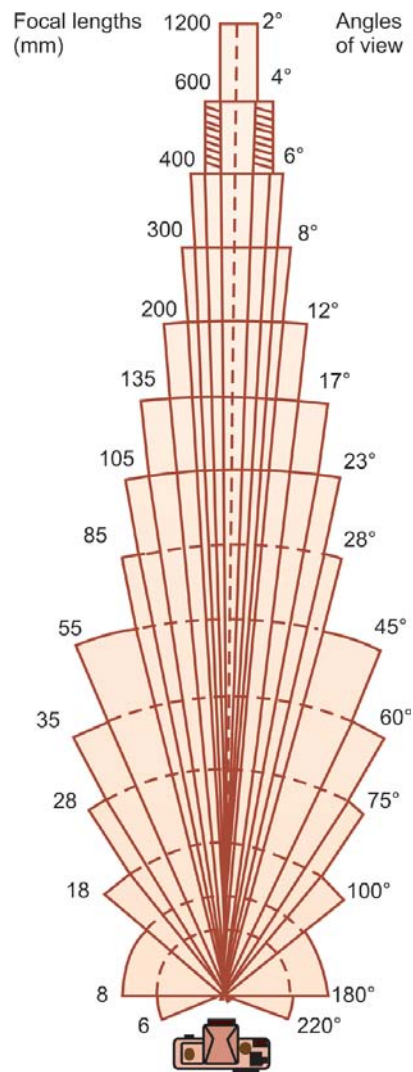


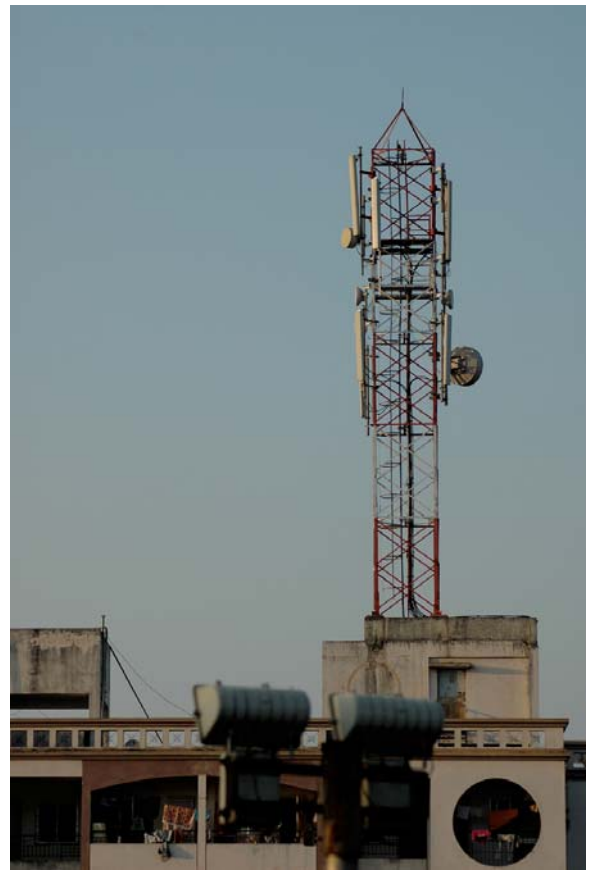
Fig. 2.6: Relation between focal length and view-angle of a lens

- Medium telephoto (70-300 mm)
- Super telephoto (above 300 mm)
- Macro

When we talk of clinical photography, we are indeed talking of close-up photography. Close-up photography will be required for most of the clinical situations, such as taking picture of a small skin lesion or oral lesion, restoration on a tooth or some pathology specimen, etc. In this context



A (Focal length = 50 mm)



B (Focal length = 100 mm)

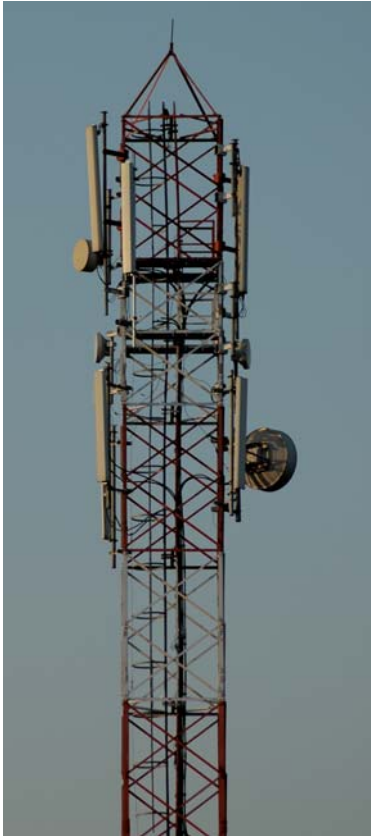
Figs 2.7A and B

close-up photography could be termed 'macro-photography'. Macro-photography is the term used to describe pictures taken at reproduction ratio of life-size and above.

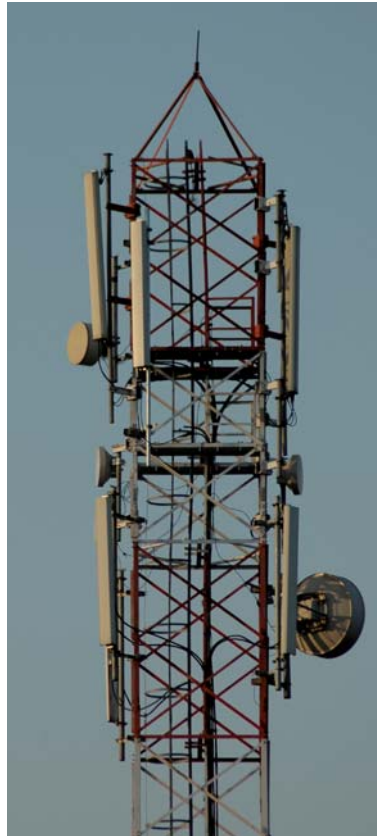
'Reproduction ratio' refers to the size of subject on a frame of film/sensor compared to its size in real life. For example, if you photograph a specimen measuring 2 cm in real life so that it measures 1 cm on a 35 mm negative or slide, the reproduction ratio is 1:2 and the magnification is 0.5x. If the same specimen measures $\frac{1}{2}$ cm on a frame of film, the ratio is 1:4 and the magnification is 0.25x. If it measures 2 cm the ratio is 1:1 and the magnification is 1x.

There are many ways for taking a close-up photograph:

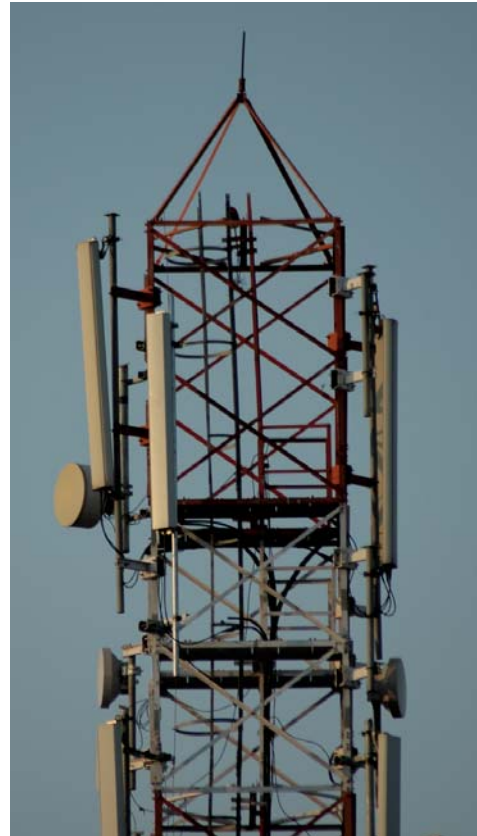
Close-up lenses: These are handy attachments which fit to the front of main lens like filters, and reduce its minimum focusing distance so that you can get much closure to the subject. The power of close-up lenses is measured in diopters and is available in +1, +2, +3 and +4. Bigger the number, greater is the magnifying capacity. A +4 diopter lens used on a 50 mm standard lens with focus set to 1 meter will give a reproduction ratio of 1:4, i.e. magnification of 0.25x (Fig. 2.8).



C (Focal length = 150 mm)



D (Focal length = 200 mm)



E (Focal length = 300 mm)

Figs 2.7A to E: Picture taken at different focal length keeping camera to subject distance constant



Fig. 2.8: Close-up lenses are threaded over a main lens

If extra magnification is required, more than one close-up lens can be used in combination. The image sharpness suffers if this is done, because the optical quality of these lenses is not all that high.

Reversing rings: This inexpensive accessory allows you to mount a lens on a camera in reverse direction, so it focuses much closure and allows taking close-ups.

The advantage of reverse ring is that it does not affect the optical quality but the main drawback is it loses linkage between camera and lens so the metering system and automatic aperture stop-down no longer works.

Extension tube: These metal tubes fit between the lens and camera body, increasing the lens to film distance, so greater image magnification is possible. These tubes normally come in set of three, each of different size for different reproduction ratio. All three can be used together to increase the magnification (**Fig. 2.9**).

When the length of extension matches the focal length of lens, the reproduction ratio obtained is 1:1. For example, 50 mm extension with 50 mm lens gives 1:1 reproduction.



Fig. 2.9: Extension tubes provide inexpensive means of shooting close-ups



Fig. 2.10: Bellows' unit are adjustable and provide variable levels of magnification

Bellows' Unit

This system works on the same principle as extension tubes, but is adjustable so that intermediate levels of extension can be obtained (**Fig. 2.10**).

Macro Lens

Macro lenses are specialized lenses that allow focusing very close without the use of any close-up lenses or extension tubes. These are fixed focal length lenses. Though comparatively expensive their optic quality is unmatched (**Fig. 2.11**).

While purchasing a macro lens one should always remember to purchase a lens with reproduction ratio of 1:1.

Macro lenses of different focal lengths are available. Since clinical photography needs a focal length of 95-110 mm, the recommended lenses are:

1. Canon EF 100 mm f/2.8 macro USM
2. AF micro Nikkor 105 mm f/2.8D
3. Sigma 105 mm f/2.8 EX DG macro

Macro lenses also serves as perfect portrait lenses, so taking photograph of patients face or any body part would be possible without changing the lens. It is highly recommended that macro



Fig. 2.11: Fixed focal-length lens with 'macro' facility is best for clinical photography (Nikon calls it 'micro')

lens should be used for clinical photography as they are hassle free and do not require changing of any accessory in nearly all situations. Alternatively, close-up lenses are also a good and cheap option, though there is some compromise on quality (*Most of the photographs in this book are taken by the author using macro lens*).

LIGHT SOURCE

If the subject is not lit adequately for proper exposure than electronic flash for illumination is needed.

Conventional flash-guns are not designed for the use at small flash to subject distance. And for close-up photography camera to subject distance needs to be very close. In dentistry, we are working in an oral cavity which is quite deep and has variety of areas casting shadows on each other. So, we need to have a light source which could work in close-up photography and also nullify the shadows (**Fig. 2.12**).

Ring-flash and ring-light are two specially designed light sources for this purpose. They fit to the front of a lens and have a circular tube and bulbs respectively to provide even, shadowless illumination, as it throws light from all directions (**Fig. 2.13**).

ACCESSORIES

Apart from the above mentioned essential armamentarium, some other accessories are needed for clinical photography, especially in dentistry (**Fig. 2.14**). They are:

- Lip and cheek retractor
- Single sided lip retractor
- Photographic mirrors
- Blower
- Electric heating bag



Fig. 2.12: Ring flash fits in front of a lens and provides shadowless illumination



Fig. 2.13: Using point flash in deep areas like oral cavity invariably casts shadows



Fig. 2.14: These accessories play important role in getting good clinical photographs

STORAGE MEDIA

In case of digital camera the most important thing is the storage media also referred to as memory card. Variety of storage media are available mainly in secure digital (SD) and compact flash (CF) category (**Fig. 2.15**).

Usually, the camera brand supports a particular type of memory card, so there is not much choice and you cannot do much about it. Memory cards are available in different storage capacity. Ideal would be 512 MB memory card for clinical purpose.



Fig. 2.15: Rather than storing captured images on film, digital camera records data to a memory card

3 Starting the Photography

Let us start with the very basics of starting photography.

First of all we need to set our camera. If you are using a film/analogue camera, then you must check whether the film is loaded properly. This can be checked by advancing the film and checking whether other side winder is turning or not.

Another very important thing is to set the film speed dial on a camera same as that of film which has been used. If it is not the same then you get either an underexposed or overexposed picture. For example, if the film speed is 100 ISO and the camera film speed dial is set to more than 100 then the result is an underexposed image. Similarly, if you set film speed dial on a camera to less than the film speed you get overexposed image (**Fig. 3.1**).



Fig. 3.1: Setting of dial to proper film speed is very essential to get correctly exposed film in analogue cameras

Nowadays, many cameras use a system known as DX coding. It sets the film speed dial automatically on your camera depending on the film you have loaded. This eliminates the risk of setting the wrong film speed.

FILM

Different types of films are available in the market today. They are meant to take pictures in different situations and also play important role in determining both the quality of image and control over photography.

Films are basically classified as 'fast' and 'slow' depending on their speed. Speed of the film is referred to as an ISO number (International Standards Organization). ISO rating gives an indication of its sensitivity to light. More the ISO more sensitive is the film to light hence, less amount of exposure it needs to create an image. Film with less ISO needs to be exposed for longer time for creation of an image.

Film speed is also related with the quality. Slow film offers fine grain, rich color saturation and more sharpness. As the film speed goes up these qualities begins to tail off. Films with an ISO rating of 800 and above have course grain, muted colors and are less sharp (**Fig. 3.2**).



Fig.3.2: Higher ISO rating film will have pictures with more grains and the colors are muted. The picture is taken with ISO 1600

Bearing these two points in mind, the first step in film selection is to decide whether speed or image quality is more important. In clinical situation, illumination of a subject is not much of a problem so there is no need for a fast film. Film with a speed of 100 or 200 ISO is ideal for clinical photography.



Fig. 3.3: Customized setting of different parameters in digital SLR camera is must to achieve natural looking results. (Customizable functions will vary from camera to camera and readers are advised to refer their camera manual)

In case of digital camera, set up the camera in the following manner for best quality.

Set internal clock of the camera to correct time. Then set to **(Fig. 3.3)**:

- Highest resolution
- Largest file size
- Color space (RGB or SRGB)
- Color mode (mode 1)
- White balance
- Sharpness to low or nil
- Contrast to low
- Saturation to normal
- ISO to lowest possible

Resolution is the measurement of image detail (dots per inch) that a device can capture and reproduce. When referred to digital cameras, resolution connotes the number of pixels that records the image.

Pixels are light detectors or photo diodes. It is the smallest element of a digital image and contains information about intensity and color. Pixel is either rectangular or square.

In general it could be said that higher the resolution, better the image quality. However, it is not necessarily so. In camera market there is a boom about more mega-pixel (MP) camera. Every manufacturer claims to launch superior camera in terms of more number of pixels in it. But actually anything more than 5 MP in APS sized sensor is of no use. Increasing mega-pixels will not work if the sensor size is same (There is no point in jumbling more than required pixels on a small sensor).

So, that means, to adjust more pixels on a same sized sensor, pixel size is to be reduced, so, it makes no difference in quality, but only serves to increase the noise or grain.

Sensors are replacement of film in digital camera. Two types of sensors are available: Charged couple device (CCD) and complimentary metal oxide semiconductor (CMOS). CCD consumes less battery power. Initially CMOS sensors were of poor quality but with technological advancement both are of competitive quality today.

File Size

File size should be set to largest to incorporate all the pixels present on a sensor in an image. This makes sure that on enlarging the photograph it will not show signs of posterization or 'mending'.

Let us see, how big a photograph can be enlarged using a particular MP camera. For example, you have 6 MP camera then printing at different dpi (dots per inch) will give following results:

6 MP = 3000 × 2000 pixels

at 300 dpi = $\frac{3000}{300} \times \frac{2000}{300} = 10 \times 7$ inch print.

at 200 dpi = $\frac{3000}{200} \times \frac{2000}{200} = 15 \times 10$ inch print.

at 72 dpi = $\frac{3000}{72} \times \frac{2000}{72} = 42 \times 28$ inch print.

Color Space

RGB has a wider color space, which means the representation of color is more accurate. For clinical photography, set the color space to sRGB with mode 1 which is for portraits.

Sharpness

Sharpness is to be set to low or nil. Unnecessary increase of this parameter may burn the detail in areas falling in shadows or single isolated area, which may at times be very essential to assess the clinical situation.

Contrast

Contrast also should be set to minus (low) as increase in it may also result in burn-out of mid-tone colors.

Saturation

Saturation should be set to normal to reproduce close to natural color. In case of compact cameras, one will notice that the image, sometimes look more vibrant and attractive than the original. This is because saturation and contrast in compact cameras are pre-set to very high. This is not a proper reproduction. Remember, in clinical photography you need a reproduction as you visualize it, for proper assessment of clinical condition.

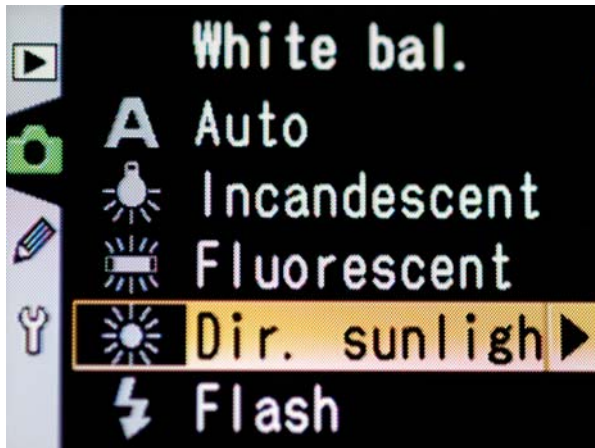


Fig. 3.4: White balance should be set in accordance with the principal light source



Figs 3.5A to D: White balance affects how camera reacts to the color casts. Above four images shows how changing WB alters the final output. All photographs are taken using ring flash as a light source. (A) WB set to flash – gives more natural looking result. (B) WB set to cloudy–produces reddish cast giving gingiva an 'inflamed' appearance. (C) WB set to fluorescent light – results in greenish hue giving a pale appearance. (D) WB set to incandescent light – results in bluish tinge and unnatural appearance

White Balance

White balance (WB) can be described as the adjustments made in camera in different lighting condition so as to reproduce exact color. Human eye can recognize white as white in sunlight as well as in shade, under tube-light or under a bulb. However, digital photosensors record this light with far less latitude and needs to be balanced to return the same neutral, white light that a human eye sees. So you must set the WB setting on your camera with the principal light source to achieve neutral looking images. If you do not set the WB properly the result will look completely unnatural (Figs 3.4 and 3.5).

International Standard Organization (ISO)

This is discussed in a section on films. For homogenous image set the International Standards Organization (ISO) to lowest possible on camera.



Exposure could be described as the amount of light that is allowed to pass through the lens, to fall on the film/sensor (Film in analogue and sensor in digital camera). This light is required by the film/sensor to fix an image on its light sensitive emulsion/diodes.

Exposure, however also refers to control by the photographer of the final appearance of his picture depending on the amount of light allowed to pass through the lens. If you allow too much or too little light to fall on the film/sensor then the picture will be either too light or too dark.

So, it ultimately means that a good image is one which is correctly exposed. How to judge this correct exposure is the key?

There are four factors that determine the correct exposure:

1. *Light level in the scene:* Light falling on the subject is reflected on to the film/sensor. If there is enough light, then a brief exposure will be enough, if the light levels are low longer exposure is needed.
2. *Speed of the film:* The film speed designated by ISO indicates its sensitivity to light. Films with slow speed, say ISO 50 are not very sensitive and would require more light (longer exposure) than a film with faster speed such as ISO 400 or ISO 800. If we use half the speed of film it requires double the amount of exposure and vice versa. For example, ISO 200 film requires half the exposure of ISO 100 film but double that of ISO 400 film (**Figs 4.1A and B**).
Lower ISO number = slower film = need more light = longer exposure required
Higher ISO number = faster film = need less light = shorter exposure required
3. *Aperture:* Aperture is the hole in the lens through which light passes from subject to the film. The size of aperture is controlled by the “iris diaphragm”. These are series of crescent shaped blades that make a circular opening in the middle of the lens. Moving these blades enlarges or reduces the size of opening (**Fig. 4.2**).



Figs 4.1A and B: Note the difference in exposure level with change in ISO number. (Aperture and shutter speed were kept constant)



Fig. 4.2: Relative size of aperture opening at different f-numbers



Fig. 4.3: Shutter speed dial on analogue SLR camera

Size of aperture is designated by 'f' number, starting usually from 1.4 till 32. These numbers are also called 'f-stop'. Small f-stop represents large aperture and gives more exposure, while large f-stop represents small aperture and gives less exposure. Each f-stop admits half or twice as much light as its immediate preceding or succeeding number. For example, f/5.6 admits half as much light as f/4 but twice as much light as f/8.

4. *Shutter speed:* The shutter speed indicates the period of time the camera's shutter stays open to let the light enter the lens. Shutter speed ranges from fraction of seconds to more than a minute. Again each shutter speed admits half or twice as much light as its immediate preceding or succeeding speed. For example, shutter speed of 1/60 seconds admits half as much light as 1/30 seconds but twice as much as 1/125 seconds (**Fig. 4.3**).

In addition to controlling the amount of exposure, aperture and shutter speed are important variables which gives creative control over photography (Discussed in detail in section on aperture and shutter speed).

How to Judge Correct Exposure?

When a film/sensor receives correct exposure, the resulting picture reproduces the subject in all its proper tones and colors. All modern day cameras, may it be SLR or a compact are equipped with a built-in-meter. This built-in-meter performs the task of determining correct exposure (**Fig. 4.4**).

This meter measures the light passing through the lens and is also known as TTL (through the lens) metering. Light is measured by special photoelectric cells. These cells are sensitive to light and produce a small electric current which activates a needle to indicate the exposure required. Older cameras used selenium or silicon cell but modern day cameras use a cadmium sulphide cell



Fig. 4.4: Built-in light meters are calibrated to correctly expose 'average' scenes having equal number of light and dark colors and a normal contrast level

(Cds), which is powered by a small battery. Cds are very sensitive and reacts much faster to give more accurate results.

Exposure reading is taken by pointing the camera towards the subject while looking through the viewfinder. The built-in-meter then measures the light reflected from the subject to determine the correct exposure. Aperture and shutter speed are then automatically selected by the camera for correct exposure before the picture is taken.

However, the built-in-meter is not totally foolproof. Eventually we encounter a situation which is difficult for light meter to assess and make exposure decisions. Recognizing those situations is therefore an important skill. All light-meters are calibrated to correctly expose "average" scenes which are assumed to have an equal number of light and dark color/tone and a normal contrast level. Unfortunately, clinical situations do not provide this and especially in dentistry where we are working with deep oral cavity, light levels are too mixed to fool a light-meter. So, these are the situations where we need to step-in and make the decision for proper exposure.

Modern day cameras are equipped with basic exposure modes to assist the operator. These modes perform the task of getting the correct amount of light for proper exposure (As mentioned in Chapter 2, your camera must be equipped with these four basic modes).

1. *Program*: This is a fully automatic mode where camera sets both the aperture and the shutter speed. Although fast and convenient to use, it offers little or no control over exposure by the operator.
2. *Aperture priority*: This is a semi-automatic mode where you select the aperture and the camera sets the shutter speed required to get correct exposure. This mode is reasonably quick and used when we need to control "depth of field", especially in table-top photography for taking photograph of a specimen or a dental model (Depth of field is described in section on aperture)



Fig. 4.5: Modern day cameras are equipped with different exposure mode to assist the operator

3. *Shutter priority*: This is also a semi-automatic mode where you select the shutter speed and the camera sets the aperture required to give correct exposure. This mode allows to control the blur caused by camera shake or motion of the subject.
4. *Manual*: Operator sets the aperture and shutter speed manually so that exposure could be varied at will. This is required when all other exposure modes fail to give satisfactory results, as in tricky light situation (**Fig. 4.5**).

For any one exposure, there is a range of shutter speed/aperture combination that may be used. That means more than one shutter speed/aperture combination will provide same exposure (However, each shutter speed/aperture combination provides different look and characteristic to the image. This is discussed in detail in section on aperture and shutter speed).

In photography, there is a rule of thumb known as 'sunny 16 rule' or rule of 'f/16' for *basic day light exposure*. It essentially means that for correct exposure, a normal subject under bright sunlight would require the shutter speed that approximates the film speed with an aperture of f/16. For example, if you are using a film speed of ISO 100, then shutter speed required would be 1/125 seconds (close approximation) at f/16. If the film speed is ISO 400, then the shutter speed would be 1/500 sec. at f/16.

Keeping this rule in mind different shutter speed/aperture combinations could be used to give 'equivalent exposure' for a normal subject under bright sunlight. For example, 1/500 @ f/16; 1/1000 @ f/8; 1/2000 @ f/5.6; 1/250 @ f/22 would provide same exposure. Also depending on a light level in the scene exposure compensation should be done to the *basic day-light exposure*.

Often one comes across a situation where it becomes very difficult to judge a proper exposure. In such situation of tricky light 'bracketing' proves to be a good technique. Bracketing, in simple



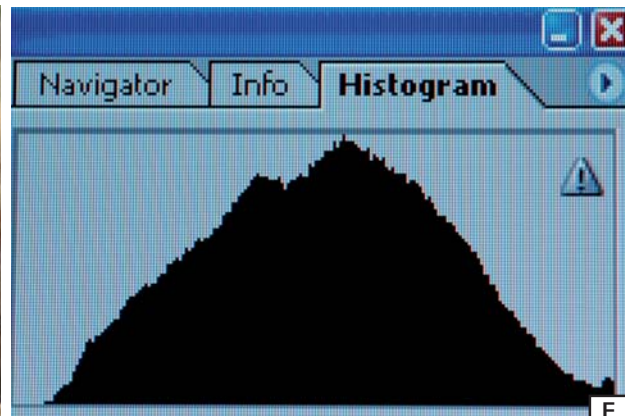
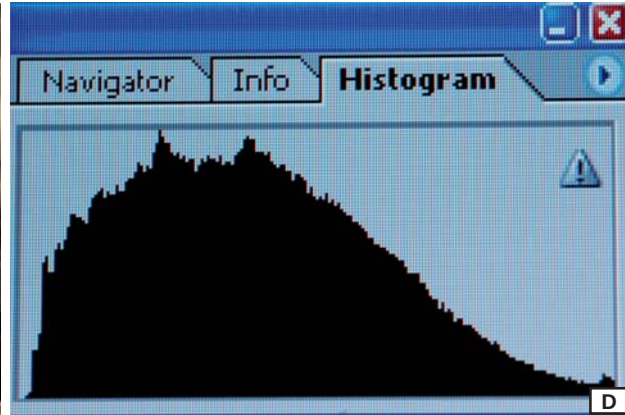
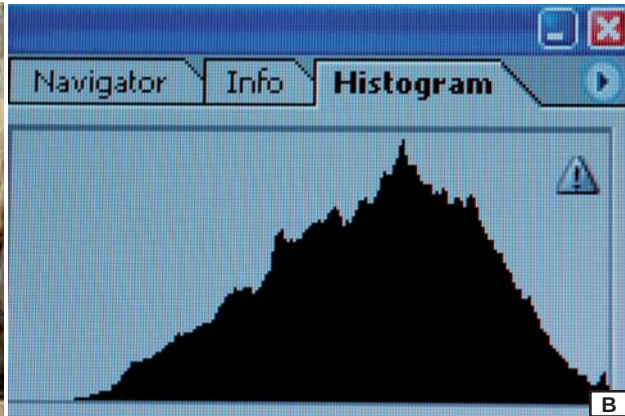
Figs 4.6A to C: This set of pictures shows effect of bracketing. It ensures atleast one picture in the series is perfect

words is shooting a subject at a range of exposures so that you can choose the most successful shot out of them (**Figs 4.6A to C**).

All you need to do is to take one picture at the exposure you or your camera thinks to be correct. Then subsequent pictures are taken over and under the initial exposure. This ensures that atleast one picture in the series is perfect (Many cameras come with a bracketing button, which if set would bracket the picture according to the exposure level you have set for the first image.)

Bracketing should not be done as a matter of course – it wastes film and time. Once you master the basics of exposure then bracketing most of the time may seem unnecessary.

To assist the operator further, digital cameras come with a feature called 'histogram'. This is one of the most useful benefits of digital camera. Histogram is a graphic representation of the brightness range in an image, indicating the number of pixels present in each brightness value between 0 (black) and 255 (white). In a good histogram (indicative of correct exposure) there is an equal spread of tones between black and white. So the operator can check the histogram immediately after taking an image and rectify the exposure if needed (**Figs 4.7A to F**).



Figs 4.7A to F: Histogram is a graphic representation of the brightness range in an image. Good histogram has an equal spread of tones and the bell of the curve is around the centre

APERTURE

Aperture, as explained previously is a hole in the lens through which light passes on its way from subject to the film.

Denoted by f-number (also called f-stop), the standardized f-number runs as follows : f/1.4; f/2; f/2.8; f/4; f/5.6; f/8; f/11; f/16; f/22; f/32; f/45; f/64. 'f' is the abbreviation for focal length. F-stop is the number by which the focal length of the lens must be divided to the aperture diameter.

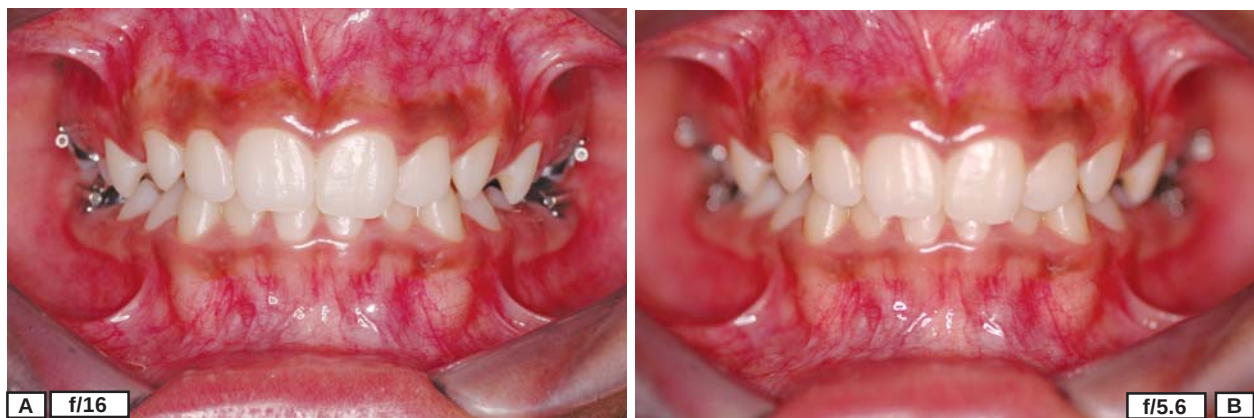
Thus,

$$\text{f-stop} = \frac{\text{Focal length}}{\text{Effective aperture diameter}}$$

A lens with a focal length of 100 mm and an effective aperture diameter of 25 mm would have an f-number of f/4. With the same lens, if the effective aperture diameter is 50 mm then f-number would be f/2. Thus, f-number gets smaller as the aperture gets larger because the aperture diameter appears in the denominator of the formula.

The main job aperture performs is to admit light for the exposure. Another very important function it serves is to help determine how much picture comes out sharply focused and how much does not. This 'zone' of sharpness is called 'depth of field' (DOF). Understanding the concept of DOF and knowing how to control it is vital to the appearance of your photograph (**Figs 4.8A and B**).

For example, a shallow DOF will help isolate the subject from the background by removing any other pictorial distractions. On the other hand, rendering the whole scene sharp will give a sense of place by including information about its adjacent structures.



Figs 4.8A and B: Reducing the aperture size (increasing the f-number) increases depth in a picture. (Orthodontic attachments on first molars can be appreciated with the use of aperture size f/16)

Three main factors control DOF:

1. *Aperture:* Smaller the aperture, more extensive is the DOF and vice versa. So if much DOF is needed smaller aperture preferably f/16 or f/22 is used.

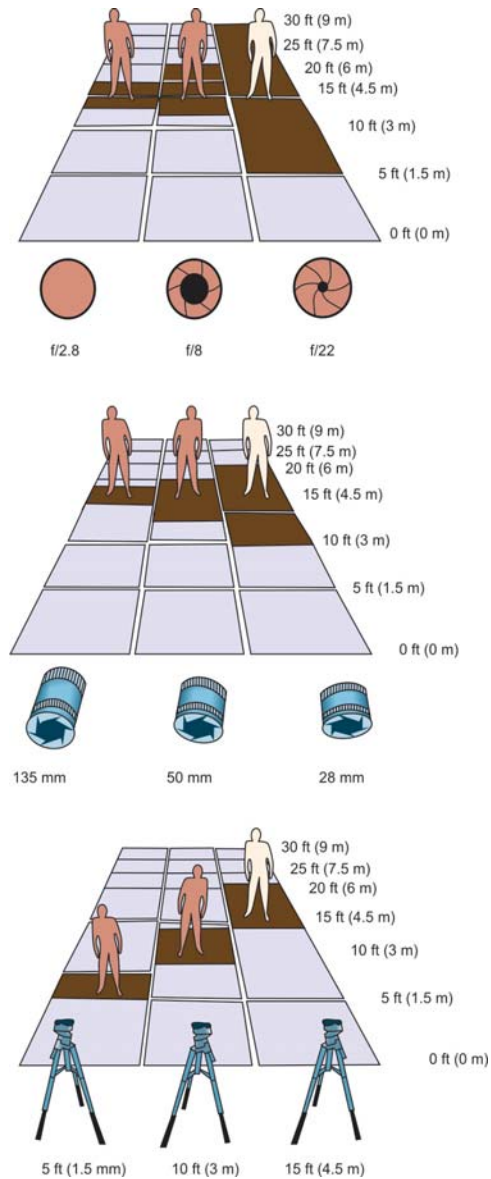


Fig. 4.9: How DOF is affected by aperture, focal length and camera to subject distance.

2. *Focal length:* Shorter the focal length, greater the DOF. For example, DOF is greater in wide angle lenses (28 mm) than a telephoto lens (105 mm).
3. *Camera to subject distance:* Greater the shooting distance, deeper the DOF. For example, if the subject is photographed from 3 meters and then from 8 meters away, the zone of sharpness (DOF) is greater at 8 meters (**Fig. 4.9**).

So, if you want minimal DOF, then use a telephoto lens and set to a wide aperture such as $f/4$ or $f/2.8$, conversely if you want greater DOF then use a wide angle lens and set to a small aperture such as $f/11$ or $f/16$.

In clinical photography, it is often advised to use a telephoto lens with a focal length of around 100 mm and also subject to camera distance is very less. Both these factors would tend to reduce the DOF. Use of larger 'f' number then remains the only available variable for increasing the DOF wherever needed. Hence, judicious use of aperture setting is of paramount importance in clinical photography for getting desired DOF.

Assessing DOF

There are two ways to gauge DOF:

1. *Using camera's stop down preview facility:* Many modern day cameras have a button to preview DOF. This button when pressed closes the lens diaphragm to the set aperture. So by looking through the view-finder keeping this button pressed you get a fair indication of DOF (**Fig. 4.10**).
2. *DOF scale:* Majority of lenses have DOF scale on their barrel. To use it, focus on your subject, find the aperture the lens is set to on either side of DOF scale and read the distance opposite them – these are the nearest and the farthest points of sharpness at that aperture (**Fig. 4.11**).

SHUTTER

Shutter speed is an important variable determining the amount of exposure. The purpose of a shutter is to protect the film from light until the chosen moment, then to open for a precisely measured time before closing once again. This *precisely measured time* is called shutter speed. Each increment in shutter speed allows half as much light to strike the film/sensor.



Fig. 4.10: Pressing the stop-down preview button and looking through the viewfinder gives fair idea of DOF

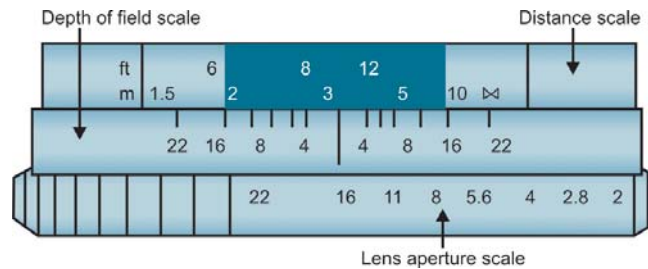


Fig. 4.11: DOF scale on lens barrel



Fig. 4.12: Blur caused due to camera shake

Less shutter speed = allows more light to pass = more exposure (Bright picture)

Fast shutter speed = allows less light to pass = less exposure (Dark picture)

Shutter speed also serves an important function of controlling the blur caused by camera shake or subject movement while the photograph is being taken. Faster shutter speed has more action-stopping ability (Fig. 4.12).

In clinical situation we are mainly concerned with the sharp image bereft of any blur. So a faster shutter speed would prove beneficial. Children are erratically moving subjects and taking their clinical pictures demand use of fast shutter speed as against static subjects in table-top photography for shooting specimens or models.

As a rule of thumb, when holding a camera the slowest shutter speed recommended to prevent blur caused by camera movement is to set the shutter speed so it matches the focal length of the lens. Thus, for 100 mm lens, speed should be atleast 1/125 second; for a 200 mm lens, speed should be atleast 1/250 second and so on.

If you encounter a situation where slower shutter speed is mandatory for proper exposure then the camera should be supported by either a tripod or a monopod. Or else use the in-built flash or accessory flash such as ring flash.

Although not needed in clinical photography, intentional use of slow shutter speed would record the motion of the subject and shall render a creative blur to the picture.

Basically, there are two types of shutter used in cameras (**Figs 4.13A and B**):

1. *Leaf shutter*: Consists of a single metal leaf that is made to uncover the shutter aperture briefly by means of a spring and lever system. Leaf shutters typically have one shutter speed and are commonly found in most point and shoot cameras. So control over shutter speed is limited. However, these are less expensive and flash synchronization is possible at any speed (Flash

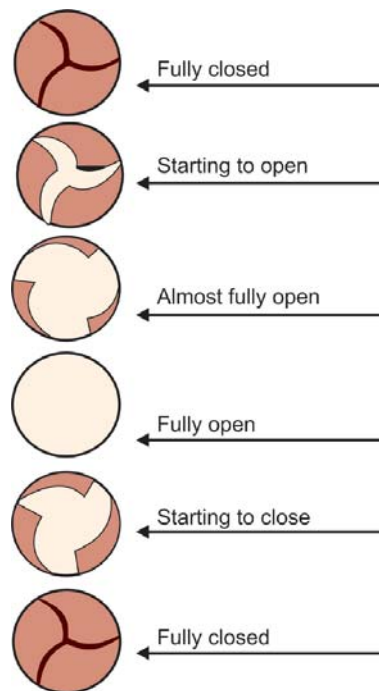


Fig. 4.13A: Leaf shutter

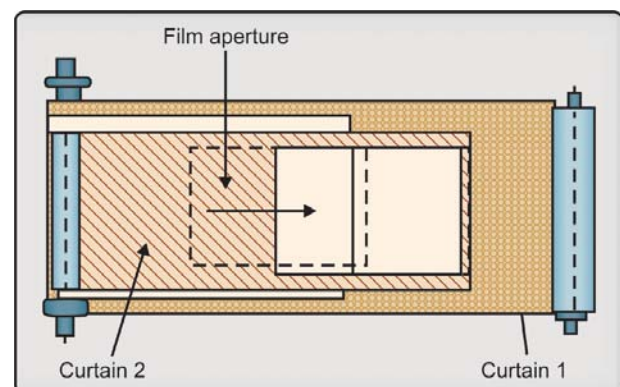


Fig. 4.13B: Focal plane shutter

synchronization denotes the maximum shutter speed which can be set so as to synchronize with the built-in flash on a camera.)

2. *Focal plane shutter*: It is situated in front of the film/sensor. It is made of cloth, rubber or metal, traveling horizontally or vertically. It is found in most SLR cameras. Shutter speed up to 1/8000 seconds is possible! However, since focal plane shutter cannot expose whole of the frame at one time flash synchronization is limited. Typically, it is only up to 1/250 sec. or 1/500 sec.

Knowing how the shutter speed and aperture combination will affect your picture is a key to understanding and using the concept of exposure and artistic creation. The operator must select the most suitable combination to make the image he desires. Operator must decide which is to be given priority. If depth in the picture is desired you must select small aperture (larger f-number) along with corresponding shutter speed for proper exposure. Aperture priority mode or a manual mode where the aperture is set according to the need can be used.

On other hand if a shallowness in the picture is desired so that subject stands out and is free of other pictorial distraction than lower f-number could be set.

If you intend to have a sharp photograph devoid of any blur then switch to shutter priority or manual mode and set higher shutter speed. If subject motion effect is to be recorded then slow shutter speed is needed. (Remember to use camera stabilizing method like tripod or monopod to prevent camera shake. All we need to record is subject motion and not blur caused by the camera shake).

Always think carefully about the aperture and shutter speed combination to be chosen, because used judiciously it puts amazing creative effect to the final image.

5

Composition

Composition is framing or deciding the boundaries. It also is the way subject is emphasized or put together within the frame.

A successful composition is visually balanced and stimulating to look at. It leads the viewer's eye around the frame, so it takes in all the important elements. An untidy composition leaves the eye wondering exactly where to go and fails to hold the attention of a viewer for more than a few seconds.

Learning to compose properly is an important skill to pick-up. It is one of the most basics in photography and is very vital in making or breaking the visual appeal of an image.

Enough time should be devoted on deciding how to capture the best of what lies before you by choosing a suitable viewpoint and controlling exactly what appears in the final picture. Although there is no magic formula for composition, following step-by-step approach can help in getting the best shots.

1. *Elimination*: Identify the subject by a logical pattern. Eliminate items from the foreground and background until only the most obvious choice remains.
2. *Perspective*: Look carefully at the subject from every level with an incremental approach. Discover the best viewpoint and make small - small refinements to the composition. Same subject shot from different level or angle will render it different perspective (**Figs 5.1A to C**).
3. *Focal point*: Most pictures will have or should have a main point of interest—something you wish to highlight in a picture. This point of interest also known as focal point serves two important functions. First, it is the element that the viewer's eyes are naturally drawn to and second, it adds a sense of scale to the picture (**Fig. 5.2**).
4. *Rule of third*: Including a focal point is not just enough to create an interesting composition but also its position within the frame is equally important. If a 'focal point' is placed right at the centre, the result tends to look very static and boring. Better place for the focal point is the third of the way into the frame. This is termed 'rule of third'. This rule says that you divide

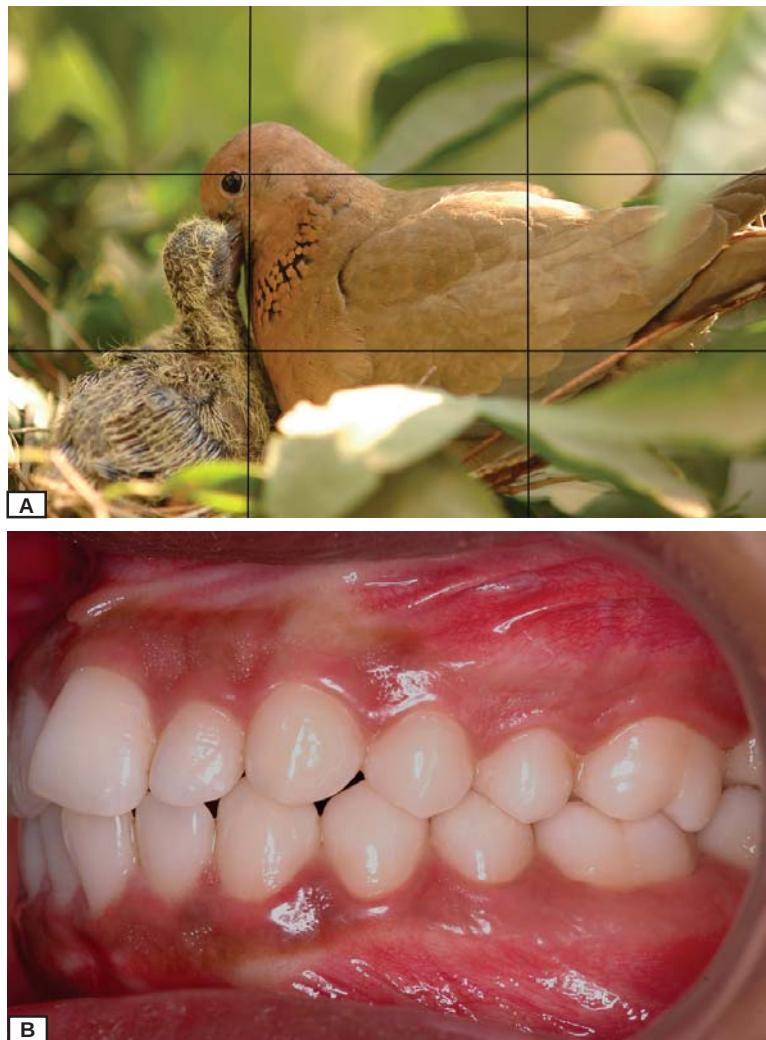


Figs 5.1A to C: Same subject shot from different angles will render it different perspective

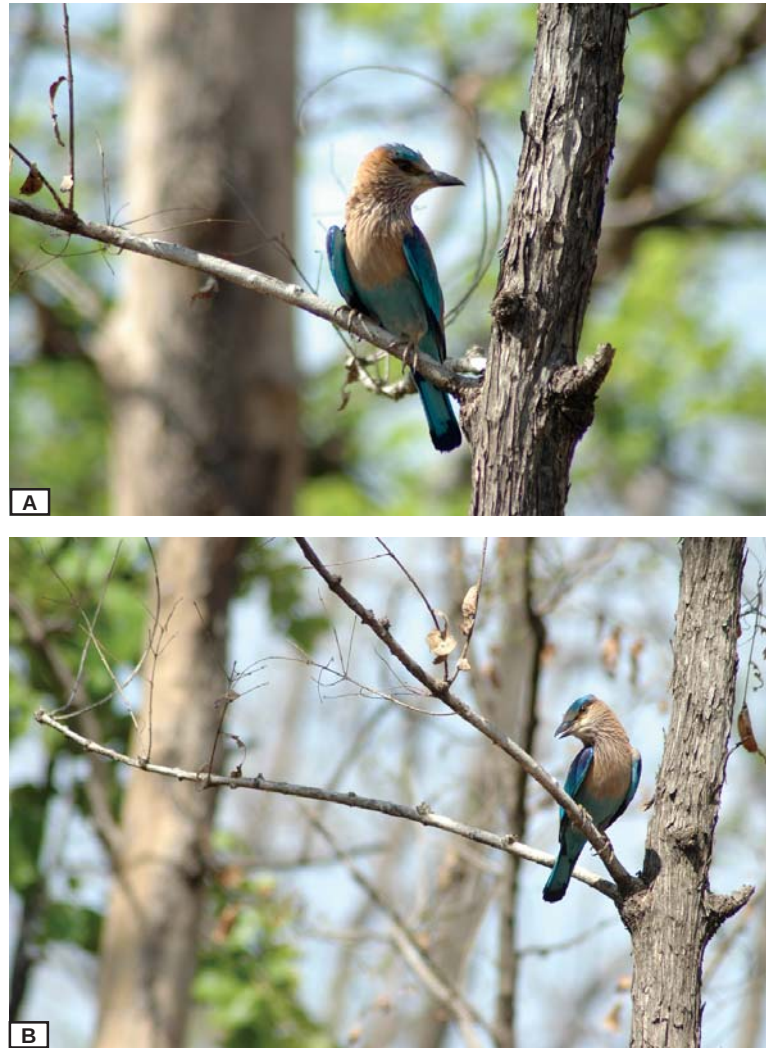


Fig. 5.2: Picture needs a focal point on which eyes can settle. In this case a boat sailing on waves

each frame into nine sections, which has got two equidistant vertical and horizontal lines much like a tic-tac-toe board so an imaginary grid is formed. That forms four intersections. The focal point should coincide with any of these four intersection points (Many modern day cameras are equipped with the facility –“show grid”. A grid is seen when looking from a viewfinder to assist in composition). Placing the focal point this way helps to emphasize it and creates a visual balance. But, a word of caution – do not force your picture to comply with the rule of third always. In the right situations it works well, but if it is overused then pictures become very predictable. It is only a guide, use it judiciously. To depict symmetry we need to place the subject in the center of the frame (Figs 5.3 to 5.5).

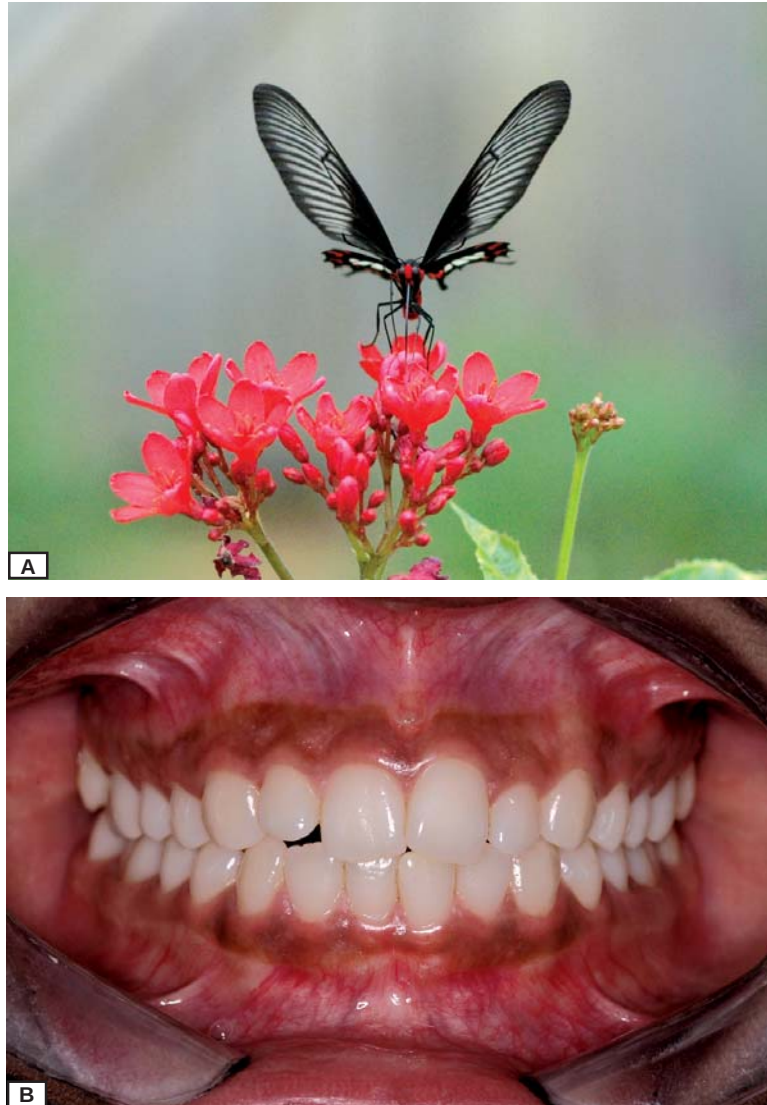


Figs 5.3A and B: In these pictures, focal point is positioned using rule of thirds for visual balance (Molar relationship is obviously the focal point in lateral intraoral photograph)



Figs 5.4A and B: If focal point is placed at the centre, result tend to look very static and unappealing

5. *Picture format:* Most clinicians automatically hold the camera horizontally, because it is designed to be held that way and is easier to use. However, turning the camera vertically can make vast difference to the composition. Use of 'landscape' or 'portrait' format should depend on the subject being photographed. Idea should be to 'fill' most of the frame and avoid too much 'negative' or empty space (**Fig. 5.6**).
6. *Negative space:* Intelligent use of negative space or the empty space can render stunning effect to the picture. As a rule of thumb negative space should be in front of the subject (**Fig. 5.7**).



Figs 5.5A and B: To depict symmetry in picture focal point needs to be positioned in the centre

7. *Develop an 'eye':* The best way to improve the compositional skill is by practicing, learning from mistakes and studying the work of 'masters'.

In clinical photography composition has been standardized in many branches of dentistry. Many of them have defined the rules of composition. However, these rules are no different from the step by step approach described above.



Fig. 5.6: Shooting facial photographs in landscape format leaves too much negative space



Fig. 5.7: Intelligent use of negative space can create stunning effect and give picture a sense of direction

Various boards including the American Board of Orthodontics, British Board of Orthodontics, American Association of Cosmetic Dentistry and Postgraduate Programs in various branches of dentistry have set guidelines for standardization of photographs. This standardization serves the purpose of looking at the pictures from same viewpoint both pre- and post-treatment thus negating any perspective bias. This is very important from clinical stand point, because all we need is to see the exact details of each case which can be comparable to any other case.

In general, this standardized protocol includes facial and intraoral photographs taken from different angles. In addition to these photographs table-top photographs may be included of prosthesis in prosthodontics and specimen in Oral Surgery. Protocol prescribed for different branches is discussed later in this chapter. Let us see the specification and method of shooting different facial and intraoral photographs. This remains by and large common to all branches.

FACIAL PHOTOGRAPHS

For facial photographs an ideal seating apparatus for the patient is an adjustable height chair with rotating base. Rotational base is useful, so that the chair could be rotated for different views keeping the camera in one place. Alternately a dental chair also could be used. (Most of the times this is the convenient way a clinician finds in his office). Camera position can be altered for various angles (Fig. 5.8).



Fig. 5.8: Ideal sitting position for facial photography



Fig. 5.9: Red eye reduction mode acts by firing a tiny pre-flash in order to close down subject's irises

For facial photographs, certain rule remains constant:

- Head should be positioned so that the Frankfort Horizontal Plane (FH) is parallel to the floor. This means that the eyes are in one line.
- Avoid closed eyes. Pre-warn the patient for the use of flash and ask him to keep the eyes open. Alternatively, ask the patient to blink just before clicking.
- Avoid red eyes. (Red eye occurs when flash bounces back off the retina and onto the film causing them to look red). Use red eye reduction facility of camera (**Fig. 5.9**).
- Avoid shadow. It looks ugly. It destroys the visual appeal and acts as a distractor. Use a plain white cotton cloth as a background. One light source should be at the top of patient's head. Use of telephoto lens and intelligent use of point flash helps prevent shadows.
- Avoid open mouth in front and profile view if there is no breathing problem. This helps in visualizing the lip strain and effect of anterior teeth on a lip profile. Similarly, avoid glasses as they create a glare with "bounce back" from a flash.
- All facial views should be taken in portrait format only. Landscape format unnecessarily leaves too much 'negative' spaces.
- Use smaller aperture (large f-number usually f/8) to get sufficient depth of field and have entire picture in sharp focus.
- Use of built-in point flash of a camera is sufficient for facial photography.
- Whenever possible, shoot facial photographs without using flash to avoid shadows.

Full Face Front

Camera should be positioned in front of the patient at the level of patient's head. Do not tilt the camera up or down. Keep it parallel to the floor. Ask the patient to sit upright comfortably with head unsupported. Patient should be relaxed with lips closed. He should not be smiling.

Compose the picture by changing the focal length of a zoom lens or if a fixed focal length lens is used then moving back or forth. The above boundary should be just above the head, lower at the larynx area and side ways equidistant space beyond the ears should be left. Compose the photograph in portrait format. Use of telephoto lens and white background close to the patient's head will help eliminate shadow to a large extent even when built-in flash fires from one side when camera is held vertically for portrait mode.

Focus at infraorbital region. Autofocus of camera works well in facial photography. Aperture should be kept at $f/8$.

Front Smile

This view should be taken with patient seated comfortably on a chair in relaxed position, looking straight with FH parallel to the floor.

The idea behind shooting a smile is to capture the impact of dentition on the smile and aesthetic appeal of that smile. Ask the patient to give a broad smile with teeth preferably in occlusion. Avoid wide open mouth.

This view is to be taken in a similar fashion as full face front view, the difference being the patient is smiling with teeth exposed. Focus should be on the exposed teeth as it is the 'focal point'.

In addition to full face smile it is also useful to shoot a close-up of a smile. Typically, the exposure needs to be reduced by at least 1 to 2 stop as the flash unit comes nearer to the subject (Aperture size should be decreased. Increase f-number from $f/8$ to $f/16$). Composition should cover the exposed dentition. Upper and lower boundaries should be 8-10 mm beyond the outer borders of lips. Sideways it should be at least 8 mm beyond the angle of mouth.

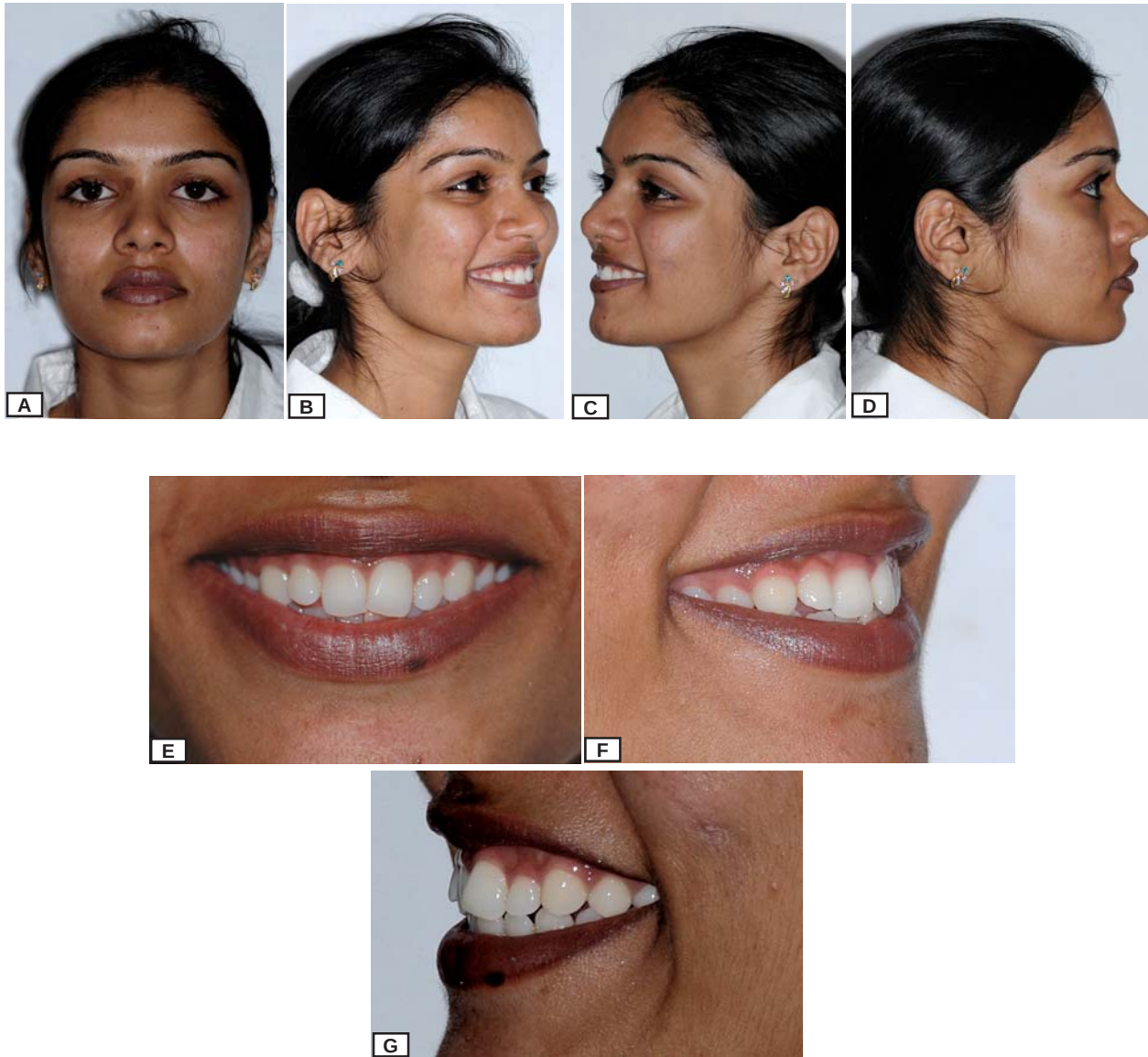
Lateral Oblique Smiling View

The idea is to capture the so called social smile. Here 3/4th face is captured with a natural smile so that the teeth are visible.

The patient is positioned similarly to the front smile view. Camera is placed at 45° angle on one side. Focus is on eye. Patient is asked to give a broad smile so that anterior teeth are exposed. Teeth should be preferably in occlusion. Avoid wide open mouth.

Compose the picture in such a way that there is some "negative" space left in front, posterior boundary should be just at the occipital region. Upper and lower borders should be just above the head and at the level of larynx respectively, similar to that of frontal view.

Camera should be held vertically in such a way that the in-built flash comes towards anterior of the patient's face. Focus at the infraorbital region of the side facing you. Again autofocus works well. Aperture should be kept at $f/8$.



Figs 5.10A to G: (A to D) Ideal facial photographs, (E to G) close-up smile—front, right and left lateral

Procedure remains same for right as well as left oblique view. Patient's chair should be turned so that left side of the face is at 45° and faces the camera. Also camera should be turned 180° so that flash fires from front.

In addition close-up lateral view of smile is also useful for close perusal of the smile. Here also exposure needs to be reduced by increasing the f/number. Composition should be covering the exposed dentition along with upper and lower lips.

Profile View

Position the camera at 90° to the right of patient's face. Looking from this angle, you should be able to see the patient's eyebrow closest to you; other side should not be visible. A slightly oblique view can falsify the patient's condition. Make sure to expose patient's ear and hair. Patient should be looking at distant with FH parallel to the floor.

Compose the picture in portrait format so that entire head is visible with upper and lower border just above the top of the head and at the larynx respectively. Posteriorly it should be at the occipital area. Anteriorly some negative space is left to give picture a sense of direction. Lips should be closed and positioned at the intersection of the 'tic-tac-toe' board to confirm with the law of third.

To avoid shadow, hold the camera such that built-in-flash is towards the anterior. Focus on eye. Autofocus works well. Aperture should be kept at f/8 like any other facial view (**Fig. 5.10A to G**).

Intraoral Photographs

Intraoral photographs are slightly more challenging than the facial photographs. The standard accessories required are: lip and cheek retractor, single sided lip retractors, photographic mirrors and electric heating bag (Refer Chapter 3). Before taking the intraoral photographs, thorough scaling and polishing should be carried out atleast a week before. On the day of taking photograph again teeth should be polished with rubber cup and pumice slurry so that they are free of any stains and materia alba. (This should be a routine for all branches possibly with an exception of periodontology in which you might be required to depict the periodontal condition and plaque/calculus deposition).



Fig. 5.11: Light source other than ring flash is inadequate for intraoral photography. Here yellow cast is a result of using dental chair light

Just before you click, saliva over the teeth and vestibular area should be absorbed using absorbent cotton rolls and saliva ejector. Saliva creates ugly looking “hot-spots” in a picture resulting out of reflection from flash.

Use of ring light or ring flash is highly advocated for intraoral photography. Point flash or other type of light source is inadequate to nullify the shadows casted by anatomical structures in the oral cavity (**Fig. 5.11**).

Intraoral photographs should be taken with patient seated on a dental chair.

Front Retracted (**Fig. 5.12A**)

Ask the patient to sit erect with teeth in occlusion. Use of cheek retractors supported by a wire frame is very useful in symmetrical retraction of lips and cheeks. Assistant should give a gentle lateral and forward pull with retractors to emphasize the depth and expose the dentition perfectly. Pull should be symmetrical; otherwise labial frenum might be pulled towards one side and may create distraction in an image. Ask the patient to keep the tongue retracted especially if the tooth is fractured or there is an open bite, to have contrast between tooth and the background (**Fig. 5.12B and C**).

Position the camera so that it is at the level of occlusal table and in line with the midline. Compose the picture so that midline is at the center of the frame. Upper and lower borders should cover the entire vestibule. Lateral borders should be lateral to the buccal surface of first molar, with equidistant space left on both sides.

Focus on lateral incisor. Autofocus may work reasonably well but manual focusing is recommended. Use lower aperture (higher f-number, usually f/22) to increase the depth (Camera to subject distance and use of telephoto lens tends to reduce the DOF. Refer page 34).



Fig. 5.12A: Symmetrical lateral and forward pull with cheek retractor is given for front retracted view to emphasize the depth and properly expose the dentition



Fig. 5.12B: Intraoral front retracted shot



Fig. 5.12C: Asymmetric pull from cheek retractor drags the labial frenum on one side causing distraction and asymmetric look

Right and Left Lateral Retracted

These views are to be taken with teeth in occlusion. Two single sided retractors, one with small end and other with large end are used (**Fig. 5.13A**).

Place larger end of a retractor towards the opposite side and smaller end towards the side which is to be photographed. (For example, if right side view is to be taken then it should be



Fig. 5.13A: Direction of pull by smaller end of single sided cheek retractor should be distal and lateral, parallel to the occlusal plane for lateral retracted view

retracted using small end whereas on left side larger end should be placed). Opposite side retractor should be given a gentle outward pull parallel to the occlusal line for imparting a sense of depth to the picture. Side to be photographed needs to be pulled distally and laterally parallel to the occlusal line. Just before a 'click' give a firm but controlled distal pull with retractor to have some extra exposure of dentition.

Camera should be at the level of occlusal surface and in line of first bicuspid. Compose the picture with first bicuspid in center of the frame. Anteriorly, it is slightly anterior to the central incisor. Some portion of the mesial aspect of opposite central incisor should be visible. Posteriorly, it should include atleast the mesial aspect of second molar. Upper and lower frame should cover the maximum of vestibule. Occlusal line is parallel to the frame.

Focus on first bicuspid. Generally, auto-focus works well. Exposure needs to be slightly decreased (Increase the shutter speed by 1 stop) to match the exposure level of front intraoral photograph.

This is because, in side view there is no darkness of oral cavity involved as in case of front intraoral view. So there is more light in the scene. Aperture should be kept same as front intraoral view i.e. f/22.

Same procedure is to be repeated on the other side. It is a good practice if right side is shot first and then the left side. This automatically arranges the photograph in proper order.

Alternatively buccal views can also be taken using mirrors. However, since it is a mirror shot the image will give an illusion of opposite side. So, they have to be 'flipped' with some computer software for proper side identification (**Figs 5.13B and C**).



Fig. 5.13B: Intraoral lateral retracted shot.

Upper and Lower Occlusal

For these images, chair's back rest should be tilted by at least 45° so that patient's eyes faces upwards towards the ceiling. Symmetrical retractors supported with wire are used for cheek and lip retraction (**Fig. 5.14A**).

For maxillary shot, ask the patient to open the mouth wide enough, place the retractors and insert the mirror. Assistant holds the mirror and places it at 45° to the occlusal surface of maxillary arch in such a way that whole of the dentition is visible in the mirror till terminal molar (If that is not possible, atleast 2nd molar should be visible). For edentulous mouth retromolar pad area should be visible. Ask the patient to breath normally through nose.



Fig. 5.13C: Intraoral lateral retracted mirror shot. Mirror shot needs to be flipped horizontally for proper side identification. (These pictures are not 'flipped')

Keep the camera so that it is perpendicular to the mirror and compose the image. Anterior boundary should be at least 2 mm in front of the incisal edges of central incisors, posteriorly at least 2nd molar's mesial surface should be included in the frame and laterally 2-3 mm away from the buccal surfaces equidistant on both sides. Midpalatal raphae should be aligned in center of the frame. Mesial surfaces of 2nd molar should be in one line (**Fig. 5.14B**).

Similar procedure is to be repeated for mandibular occlusal image. The difference being the mirror surface is reversed so that instead of showing maxillary arch it now shows mandibular



Fig. 5.14A: Placement of mirror for maxillary occlusal shot

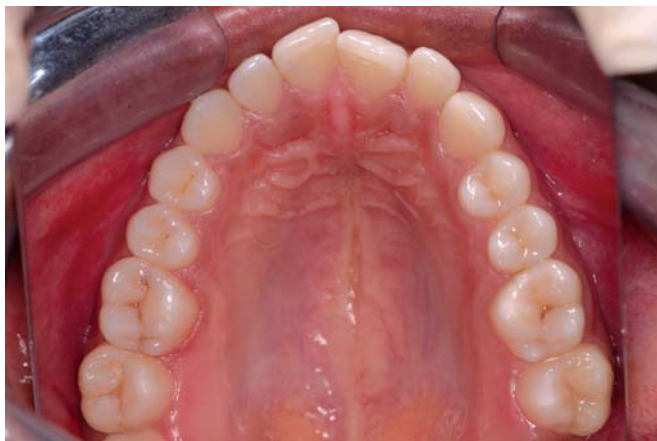


Fig. 5.14B: Maxillary and Mandibular occlusal mirror shot

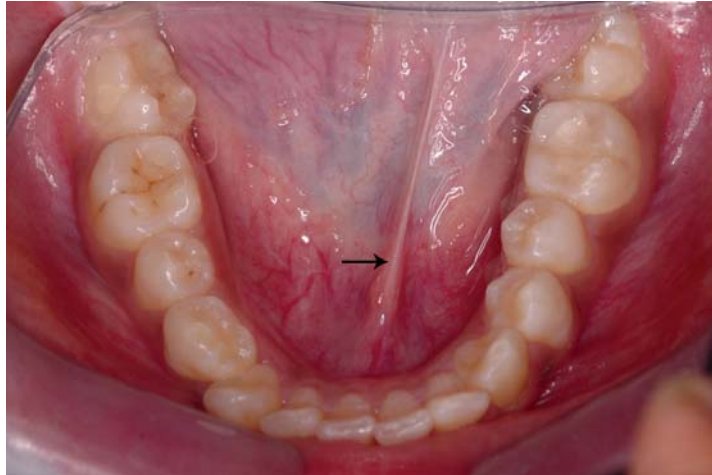


Fig. 5.14C: If tongue is retracted on one side while taking mandibular occlusal photograph then it drags the lingual frenum on that side causing distraction and asymmetric look

arch. Another difference is the presence of tongue in floor of the mouth. For clear view of dentition ask the patient to retract the tongue straight back. (If tongue is retracted side ways then lingual frenum will be deviated and the image does not depict a visual balance) (**Fig. 5.14C**).

Exposure typically needs to be increased by at least 1 stop (reduce the shutter speed by 1 stop or reduce the f/number by 1 stop say from f/22 to f/16) to match the exposure level of other intraoral shots. Usually in mirror shots camera is not able to autofocus due to reflected mixed lights, so we need to switch on to manual focusing for getting desired results. Focusing should be in the region of 1st bicuspid.

Tackling Fog

Fogging of mirror surface is a major problem in occlusal shots, especially if the patient is a mouth breather (**Fig. 5.15**).

Following step by step approach works well for tackling the fog. Keep the mirror over an electric blanket (which is kept chairside) to warm it just before it is placed in the mouth (Alternately, mirror could be immersed in warm water and dried). Ask the patient to breath slowly through nose. If still fog develops then immediately before you click, a gentle air blow from a 3-way syringe or a chip-syringe over the mirror surface will help clear the fog.

Occlusal (Mirror) shots also will be visible as opposite side (right side looks as if it is left and vice versa). So they need to be flipped with suitable computer software to give true picture and correct side identification. They are also to be turned upside down for 'natural' visual effect.

Beginners should be ready to 'waste' lots of shots before getting it right. In intraoral photography, 'patience' and 'practice' are the keywords.



Fig. 5.15: Fogging is a major problem in occlusal mirror shots

Orthodontics

American Board of Orthodontics, British Board of Orthodontics and Postgraduate Programs in Orthodontics have recommended standardized protocol for photographic documentation. This protocol is to be followed strictly both pre- and post-treatment and also during treatment if needed (Figs 5.16A to H).

The protocol includes total eight photographs in following order:

- Facial photographs:
 1. Full face front view
 2. Profile view
 3. Smiling oblique view
- Intraoral photographs:
 4. Front retracted
 5. Right lateral retracted
 6. Left lateral retracted
 7. Upper occlusal
 8. Lower occlusal

Conservative/Aesthetic Dentistry

Like orthodontics, the American Association of Cosmetic Dentistry (AACD) also ask for a standard set of photographs for their accreditation examination. This protocol must ideally be followed by every student and practitioner of cosmetic dentistry in order to document cases in a most standardized way.



A



B



C



D

Figs 5.16 (A to D)



E



F

Figs 5.16 (E and F)

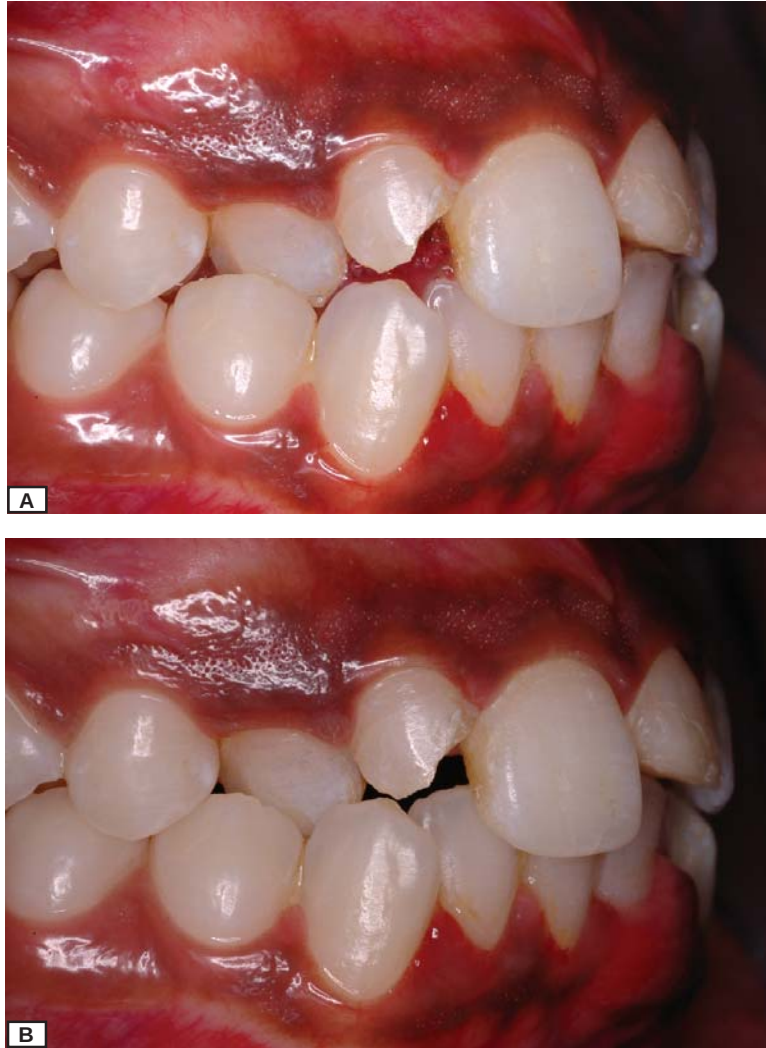


G



H

Figs 5.16A to H: Ideal photographic protocol for orthodontics.



Figs 5.17A and B: Ask the patient to keep the tongue retracted for greater contrast, especially in case of a fractured tooth.

The photographs needed (both pre- and post-treatment) are: (Refer page no. 44 to 55)

- Facial photographs:
 - Full face
 - Front smile
 - Right smile (oblique view)
 - Left smile (oblique view)
- Intraoral photographs:
 - Front retracted



A



B

Figs 5.18 (A and B)

- Right lateral retracted
- Left lateral retracted
- Upper occlusal
- Lower occlusal

For intraoral photographs focus should be placed on the tooth or groups of teeth which are to be treated or restored after treatment. Upper and lower occlusal photograph should also include a segmental view in addition to full arch view (**Figs 5.17 and 5.18**).



C



D

Figs 5.18A to D: In addition to full arch view it is also advisable to shoot sectional views for greater appreciation of restoration on a single tooth. (In Fig. B mirror was placed to capture buccal aspect of the restoration along with occlusal surface in a single frame)

Moreover there is an additional photographic documentation required for technique cases. These photographs are required to demonstrate the technique utilized to complete the direct veneer case. They are front intraoral retracted view (**Figs 5.19A to F**):

1. Initial preparation (beveling and/or abrasion of tooth surface).
2. Initial layer of restorative resin (after curing, before contouring).
3. Application of tints and opaques (if used).
4. Final layer of resin (bulk layer, after curing but before contouring).
5. After contouring but before polishing.

Prosthodontics

Unlike orthodontics or aesthetic/conservative dentistry, there are no set standardized views of photographs recommended by any board in prosthodontics.

However, this does not preclude a clinician from proper photographic documentation, which remains an essentiality in each case for presentation and effective communication.



A



B

Figs 5.19 (A and B)



C



D

Figs 5.19 (C and D)



E



F

Figs 5.19A to F: Photographs at each step are required to demonstrate the technique utilized to complete the direct veneer case

For edentulous patient requiring **complete denture prosthesis**, photographic protocol should include:

Pre-treatment (Figs 5.20A to D)

Facial Photographs:

- Front
- Profile

These views will depict the lip posture in an edentulous mouth. We also get an idea of vertical height in postural rest position.

Intraoral photographs:

- Upper occlusal
- Lower occlusal

Table-top Photograph of Finished Prosthesis (Fig. 5.21)

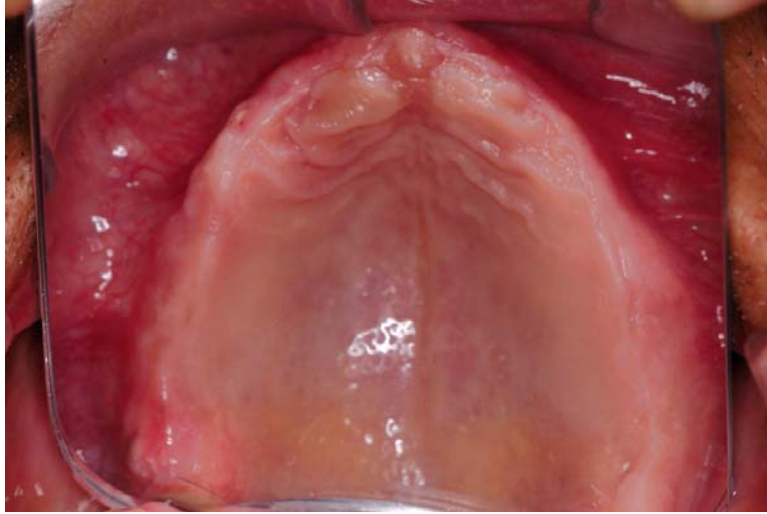
Table-top photograph of finished prosthesis should be taken from the best angle which will reproduce all the details and depict its dimensionality. Although more than one table-top shot can be taken



A

B

Figs 5.20 (A and B)



C



D

Figs 5.20A to D: 'Pre-treatment' photographic record of an edentulous patient



Fig. 5.21: Table-top photograph of complete denture



A



B



C

Figs 5.22 (A to C)



D



E



F

Figs 5.22A to F: 'Post-treatment' photographic record with complete denture prosthesis seated in the mouth

from different angles, it is always a good practice to have a single shot with most of the salient features captured. Remember keeping it simple helps in impressive presentation. Reader is urged to refer Chapter 6 on Table-top Photography for details of taking this shot.

Post-treatment (Figs 5.22A to F)

Following photographs should be taken with prosthesis 'seated' in the mouth.

Facial photographs:

- Front
- Profile
- Right lateral oblique smile

Intraoral photographs:

- Front retracted
- Right retracted
- Left retracted

For **partial prosthesis** patients following photographs should be incorporated as a standard protocol.

1. Pre-treatment

Facial photographs:

- Front
- Profile
- Front smile (If prosthesis is to be given in anterior region)

Intraoral photographs:

- Front retracted
- Right retracted
- Left retracted
- Upper occlusal
- Lower occlusal

2. Table-top photograph of prosthesis.

3. Post-treatment

All above mentioned eight photographs should be taken with prosthesis 'seated' in the mouth.

Intraoral photographs of prosthesis possess a problem of creation of 'hot spots' from bounce back of flash off the polished acrylic surface. This looks ugly. Not much can be done to overcome this, although computer software such as 'Adobe Photoshop' can come to your rescue for eliminating these so called 'hot spots' but then there are ethical issues involved (see page no. 94).

Photographs demonstrating the different steps involved can also be taken to augment your photographic protocol, to better explain the treatment progress.

Similarly for other type of prosthesis, depending on the need of a case, photographic view should be taken to best explain the patients condition both pre- and post-treatment.

Periodontology and Surgery

These two branches presents vast variations in the clinical condition. Hence, it is not possible to have a set protocol for shooting photographs. Photographs must be taken, taking into consideration the specific requirements of a case so that it is best documented. A lot of imagination should go into the study of the case for shooting the photographs.

General principles of photography remain unchanged. Facial and intraoral photographs should be taken using the specifications described above (Refer page no. 44 to 55).

As both these branches are surgical, care should be taken to have a photograph free of excessive blood as it acts as a distractor (**Figs 5.23A to E**).

**A****B****Figs 5.23 (A and B)**



C



D



E

Figs 5.23A to E: Every effort should be made to shoot surgical steps keeping the field, free of saliva and blood to avoid distraction in an image. (This series shows steps involved in surgical removal of impacted third molar and a table-top photograph of extracted tooth).

Periodontists should take extra precaution in setting the white balance. If not set properly photograph may give false notion of periodontal condition.

Taking photographs of surgical procedure in operation theater (OT) is challenging for a surgeon. Camera should be covered in a transparent aseptic polythene bag with hole cut for lens to peep out. An assistant should be trained and given the task of photography (**Figs 5.24A to E**).

It is difficult to shoot photographs of surgical steps, especially due to flooding of surgical site with blood and saliva. However, every effort should be made to free the site from saliva and blood so that image quality is more than adequate to judge the standard of surgery. All the images must be adequately exposed, framed and focused.



A



B

Figs 5.24 (A and B)



C



D

Figs 5.24 (C and D)

PHOTOMICROGRAPH

For shooting photomicrograph, we need:

1. an 'eyepiece' attachment of similar diameter to that of lens of a camera.
2. camera lens capable of 1:1 reproduction and a 'macro' facility.



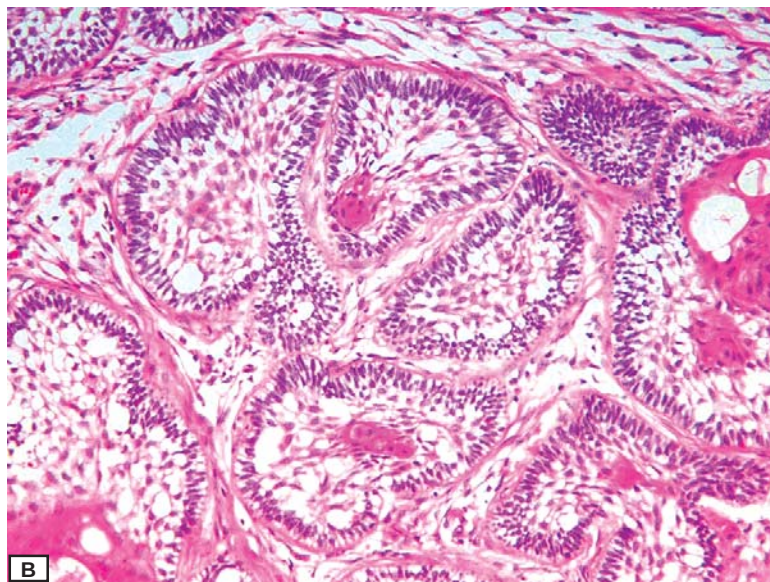
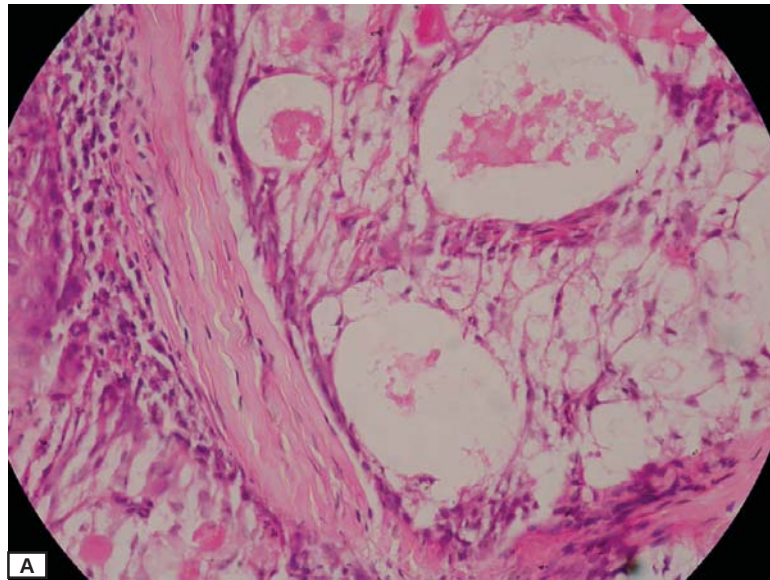
E

Figs 5.24A to E: Composition of all photographs in a series demonstrating the surgery should be kept same. (This series of photograph shows steps involved in guided tissue regeneration procedure)

Slide to be photographed should be focused with requisite magnification. Camera lens is focused through the eyepiece attached to the view-finder of a microscope. Aperture size should be kept smaller (large f-number, usually f/16) to have complete scene in focus. Manual focusing on area of interest is recommended. Exposure mode should be set to aperture priority or a manual mode keeping aperture size minimum (**Figs 5.25 and 5.26**).



Fig. 5.25: "Eye-piece" for shooting photomicrograph



Figs 5.26A and B: Photomicrographs should be taken so as to have 1:1 reproduction to the magnification adjusted in the microscope. (These photomicrographs of mucoepidermoid carcinoma and ameloblastoma have 40x magnification)



Table-top photography, also referred to as still life photography, is perhaps the least touched subject when clinical photography is discussed, as it is considered by many to be very simple and an easy job. However, shooting models or specimens to reproduce their dimensionality is a daunting task. It demands a great deal of patience, care and imagination.

The purpose of table-top photography is to bring out texture and dimensionality of the object. The goal is to give appealing visual sense of the object.

To bring out all possible details and to show the proper size and shape of the object, two more items are needed in addition to those required for clinical photography. They are **(Fig. 6.1)**:

1. Tripod, to keep your camera steady and
2. Soft-box, a tent prepared of a tressing paper.

Camera Settings

Use a lower ISO film (in case of digital camera set the lowest ISO) for optimum image quality and resolution of fine details. Use of appropriate white balance depending on the light source is must to reproduce natural looking colors. In terms of lenses a telephoto lens of around 100 mm focal length with macro facility is a must to get distortion free images (This is the same lens which is used for clinical photography).

Composition

Table-top arrangements are best if kept simple so that maximum stress is on the object. The effect is strengthened by straightforward presentation. Vertical or horizontal composition depends on size and shape of the object.



Fig. 6.1: Sturdy tripod is must for table-top photography to prevent blur caused due to camera shake

Do not place too many objects in a particular shot. Try to shoot only one object at a time. If at all you place more than one item then see to it that these items compliment each other.

Give maximum stress on arrangement of an object. This is the most important factor in table-top photography. Pathologic or any soft tissue specimen should be free of any blood stains. Similarly, models should be clean and dust-free. As a clinician-cum-photographer you must have prior knowledge of the specimen/model and its relevant clinical features to shoot it effectively. Understanding the purpose of shooting is necessary to have meaningful reproduction of an image.

Model/specimen always looks appealing if it is pictured from an angle and not from top or object level. This will make it look the way we see it. Study through various angles and shoot from the most interesting angle which reveals most of the desired details of a specimen. Remember, shooting from different angles can alter the meaning of a shot immensely.



Fig. 6.2: Plain white cloth draped on a chair is an ideal setting for shooting table-top photograph

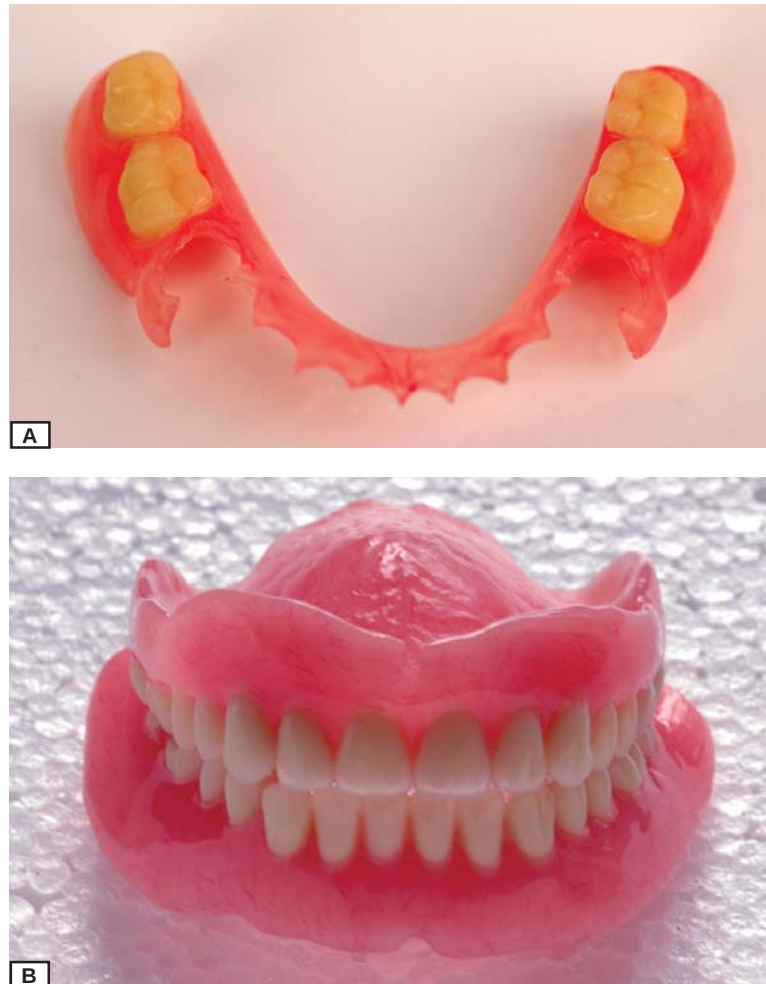
If scaling of a specimen is desired than an appropriate scale should be incorporated in the shot. Scale should be kept at the closest vicinity to the area which is to be scaled. Care should be taken so that it does not create distraction in a picture.

Plain and simple background works best as it does not create any distraction and helps to concentrate on the main picture. A plain white cotton cloth is the best. To shoot light colored object, dark plain background to give contrast is preferred (**Figs 6.2 to 6.4**).

Light Source

The type of lighting is to be kept simple. Rather than spending on expensive studio lighting it is best to use the natural light source, the sunlight. Sunlight is the most amazing light source. It is so natural that you get what you see. Artificial light does not have that sparkle.

Of course direct sunlight is very harsh and creates strong shadows of an object giving a distracting look to the picture. A shadow less image gives object a neat and tidy look which is possible only by using diffuse light.



Figs 6.3A and B: Table-top shot should be taken from an angle which reveals the dimensionality and maximum details of a model

Shiny objects such as highly polished acrylic or metal portion of orthodontic appliances or those objects having multiple surfaces which creates strong reflections needs to be treated carefully using a diffuse light as they create 'hotspots' which look unnatural and unattractive.

A soft-box is very useful in giving a diffuse light. It is simple to prepare. Take a tressing paper sheet and prepare a tent of it. Window is cut on the side towards the top for entry of the lens. This tent is kept under sunlight so the object placed inside this tent receives diffuse light. This produces an all-encompassing shadowless form of light that adds an overall sheen to shiny surfaces and reveals their shape perfectly. The same tent can be used under artificial light focussed from all sides to give diffuse light. But wherever possible it is best to use natural light.



Fig. 6.4: Scale for pathology specimen should be positioned such that it compliments the image and does not act as a distractor. (Note the use of contrast color background)

An overcast day is perfect for table-top photography as in this case sky will behave like a soft box.

Alternately, object is surrounded by white thermocol sheets to avoid complex overlapping shadows. One can also put a plain white overhanging cloth on a chair with handle and keep the model over it. This also will help nullify shadows to a great extent. Sometimes blended shadows may give certain object a sense of depth. So you can experiment and compare the results.

Exposure and Focusing

Depth of field is very important in table-top photography. For achieving maximum depth set the camera to aperture priority or manual mode and use aperture of $f/16$ or $f/22$. This small aperture demands a reciprocal use of slow shutter speed for proper exposure. Use of tripod therefore is a must for this type of photography to avoid camera shake and get sharper images.

Often while using a white background, the camera meter will underexpose the picture because it thinks there is lot of light in the scene (since more light is reflected from white surface). So switch to manual mode and just overexpose by reducing the shutter speed by 1 stop. When using a dark background reverse happens, camera meter will overexpose the picture. Again here switching to manual mode and underexposing by 1 stop gives proper result.

Auto focus of a camera does not work efficiently in table-top photography. It is advisable to use manual focusing to get the desired results.

7

Photographing a Radiograph

We often hear from radiologists that for proper interpretation of radiograph it should be visualized on a good 'X-ray viewer' in a darkroom. This way it is possible to detect minute details to enable proper analysis and arrive at appropriate diagnosis.

The condition is same when it comes to photographing a radiograph. The only difference is instead of a human eye it is the camera which has to 'see' it.

Photograph of a radiograph is needed not only for presentation but also for publications. Orthodontists may use photograph of a cephalogram taken with digital camera for cephalometric analysis using commercially available software (care needs to be taken to enlarge the image to reproduce 1:1 ratio).

Study and interpretation of radiograph in itself is a very detail and precise subject. So, while photographing a radiograph care needs to be taken to reproduce the details as it is. Photograph should be of a diagnostic quality.

Equipments required are darkroom, 'X-ray viewer', and a tripod.

'X-ray viewer' should be at least 1 inch larger overall than the size of a radiograph. It must be clean, dust free without any spots and the backlighting should be even and not creating any patchy lights. Viewer box should be oriented vertically so that when a camera is mounted on a tripod it is perpendicular to the radiograph and parallel to the floor. Place the radiograph in the center of the viewer and fix it with transparent cellotape on all four corners. Adjust the height of a tripod so that the camera's lens is at the level of a radiograph, so as to enable shooting perpendicular to radiograph. Switch off all other lights in the room to make it dark except the light from a viewer. (For better results it is advisable to photograph in darkroom or during nights) (Fig. 7.1).

As far as lens is concerned, using the same fixed focal length of around 100 mm with macro facility as is used for clinical and table-top photography is recommended. (So, it essentially means



Fig. 7.1: Photograph of radiographs should reproduce the details for proper interpretation

that a fixed focal length lens of around 100 mm with “macro” facility is all purpose lens for clinical photography).

Use of small aperture (large f/number usually f/11 or f/16) is recommended so that entire radiograph is in sharp focus. To reciprocate this aperture size, slow shutter speed is needed for proper exposure. Hence, use of tripod is a must to avoid blur caused by camera shake.

Composition can be vertical or horizontal depending on the type of a radiograph. But, be sure to compose in such manner that entire frame is ‘filled’ with radiograph. If the entire frame is not filled and allows vicinity light from viewer to be ‘seen’ by the camera then it is likely that camera meter will be fooled and the radiograph comes underexposed (**Figs 7.2 and 7.3**).

This is because, when the program mode is used the light reflected from a viewer will make camera meter ‘think’ that there is lots of light and hence, it compensates by reducing the exposure level. This will result in an underexposed image which may have lost details especially in radiolucent areas. Worst, it may not record any visible details.

To avoid this from happening it is advisable to ‘fill’ the entire frame. If that is not possible (as in case of OPG or an IOPA radiograph) then focus on the dark area of a radiograph and take a meter reading. Switch to ‘manual mode’ and overexpose by 1 to 2 stop (reduce the shutter speed or use exposure compensation button) over this meter reading to get perfect results.

The goal should be to have a photographic image no different from the original radiograph so that it is equally useful for reliable interpretation.



Fig. 7.2



Fig. 7.3

Figs 7.2 and 7.3: Format for composing photographs should depend on the type of radiograph

8 Silhouette Photography

A silhouette is defined as an outline that appears dark against a light background. To put it simply, it is where subject is seen as a black shape without detail against a bright background (Fig. 8.1).

This type of photography requires precision. Although, it is not a very huge branch in photography it is very interesting and in certain clinical situations very useful. For example, capturing patient's profile in orthodontics or giving a creative viewpoint for some specimen (Fig. 8.2).

Silhouette can be achieved with any kind of bright light source, but the most commonly used is the sun around sunrise or sunset.

The backlighting from a bright light source shadows everything towards a photographer and produces silhouette effect. Solid objects will be seen as silhouettes while transparent materials take on a wonderful luminosity that emphasizes patterns.

The key to silhouette lighting is to keep the background brighter than the subject. This can be done in more ways than one. The simplest is to photograph your subject (or object) against a bright sky usually around sunset. At this time of the day sky is at its brightest so that there is greater contrast between the subject and the background (sky). Another way is to use a bright illuminated wall (white) and place the subject against it in relatively darkroom so that light does not directly fall on the subject.

If you set camera on automatic exposure, make sure to focus on light in the background. This way camera 'thinks' that there is enough light and it reduces the exposure so that you get silhouette. Best is to use manual mode and focus on the subject and apply minus exposure (using exposure compensation button in digital SLR) or underexpose by couple of stops to darken the shadow areas to a point where no detail is visible.

As far as aperture selection is concerned, always use a narrow aperture (large f-number) so that the whole scene is in focus.

Remember, silhouette is an artistic out come and it takes practice, patience and experimentation in creating a spectacular silhouette image.

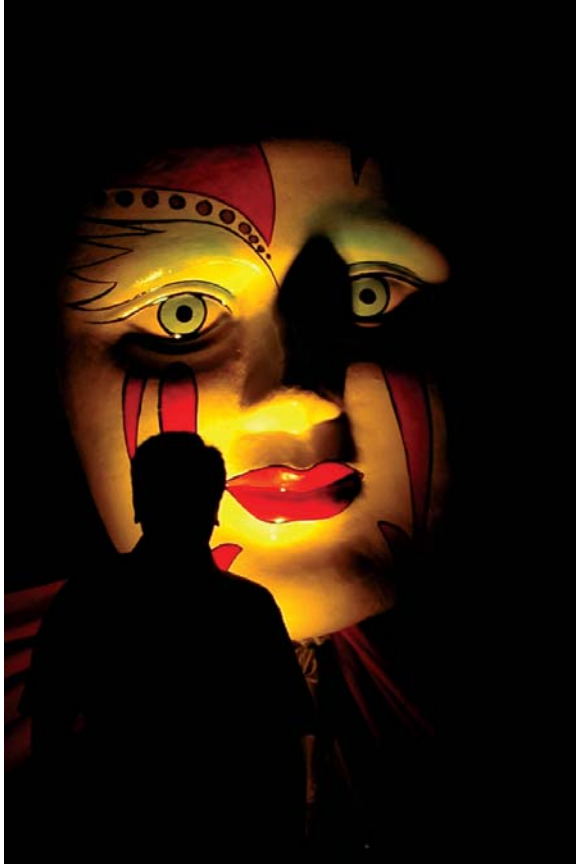


Fig. 8.1: Silhouette photography needs a bright illuminated background



Fig. 8.2: Silhouette is useful for distraction free interpretation of a profile

9

Storage and Care

Camera and lenses are delicate precision equipments. In order to have a long and happy life of these equipments we need to treat them with reverence and care.

Care and proper storage is not only an economic requirement but is also important for better quality of pictures every time you shoot.

Damp and humidity are the main enemies of photographic equipments as they encourage growth of fungus. So the first priority should be to store them in a dry area. Once the fungus catches up it may cause irreversible damage to the camera and lenses.

Camera

- Keep the camera safely inside a bag or case when not in use. Never leave it lying around uncovered.
- While taking a photograph always put the camera strap around neck to prevent any accidental fall in case it slips out of your hand.
- Store the camera in a bag kept in a dry area away from direct sunlight. Keep some silica gel in the bag to soak extra moisture.
- Check the camera periodically for loose screws and tighten them with a set of jeweler's screwdriver.
- If camera is going to lie unused for several months, remove the batteries to prevent corrosion.
- Do not change the lenses in windy outdoors. Dust can easily enter into the camera body. Always change the lenses in a clean closed room with the camera placed in a clear polythene bag and lens mount aperture facing down. Make changeover a quick process. Do not leave the lens mount aperture exposed to the air for any length of time.
- Give camera a regular dust down with a soft brush, clean the viewfinder eyepiece with a lens tissue and blow off the mirror with a blower brush (Fig. 9.1).



Fig. 9.1: Chip-syringe and blower brush are handy accessories for cleaning dust off the camera

- Never touch the shutter curtain – it can easily be distorted and may make the shutter speed inaccurate.
- If a fault develops, never try to repair yourself. Take it to a professional authorized repairer.

Lens

- Do not get the lenses wet. Avoid shooting in rain or near splashing water.
- Fit a clear skylight or UV filter to the front of lens (Keep it forever, it does not affect the picture quality). This protects the front element from accidental scratching and reduces the need to clean the lens (Fig. 9.2).
- Use lenshood for protecting the front part of the lens from accidental scratching.
- Remove any loose dust or hairs with a soft blower brush, then clear remaining particles with a blast of air from a 'chip-syringe'.
- Wipe any finger marks or greasy smears with a lens tissue. Use a special lens cleansing fluid. Wipe the lens in a circular motion starting at the center and working your way out.
- Keep the front and a rear lens cap in place at all times when lens is not in use, to protect it from dust particles.
- Store the lenses in an airtight container with a bag of silica gels.



Fig. 9.2: UV filter should always be kept fitted over the lens to protect it from dust particles and accidental scratching

Film (Fig. 9.3)

- Always keep unused film in its plastic canister to prevent dirt and grit collecting on a felt light trap. This can lead to scratches down the whole roll.
- Store unused films in a cool place – preferably a refrigerator – in a sealed container. Remove several hours before use and leave to warm up to room temperature.



Fig. 9.3: Develop the film before the expiry date for better results



Fig. 9.4: Store the film in a cool, dry area for greater color accuracy. Never store it above the temperature indicated on a packet

- Never leave film in direct sunlight or the glove compartment of a car. High temperatures can cause color shifts (**Fig. 9.4**).
- Process used films as soon as possible.
- Always use films before the expiry date.
- Avoid having film X-rayed at airport security checks (Insist on manual inspection instead).
- It is very important to take care of negatives to ensure better quality reprints. Do not handle the negatives with bare hands as the fingerprints may show on the resulting prints.
- Store negatives in an acid-free negative sleeves. Label them appropriately for identification and future reprints.

Memory Cards

- Memory cards especially CF cards should be inserted in a camera's slot very carefully in a straight line (Pins inside the camera which engages the female portion of CF cards may get damaged if not inserted in a straight line and may lead to irreparable damage to the camera) (**Fig. 9.5**).
- Memory cards must be formatted before first use and periodically later on. It also should be formatted when exchanged between different cameras. As far as possible avoid using a card on different cameras.



Fig. 9.5: Care should be taken while inserting CF card in a camera. A little negligence can cause irreversible damage to the pins of a camera which fits the holes on a CF card

- Do not remove the card from a camera when it is being accessed. Refer to the indicator light on a camera for safe removal of a card.
- Memory cards should be stored in a dry, cool place away from direct sunlight.
- They are not much affected by “X- rays” used to scan luggage at airports. Frequent scanning however should be avoided.

10

Presenting the Pictures

Photography is a strong means of communication; its purpose is to convey information. Never think that once perfect photographs are shot, the job is over. Photograph is only a tool; it needs to be presented effectively in front of patients, audience or examiners. It must be presented in easily digestible format. This in itself is a daunting task.

Once the photographs are shot, its time now to store them safely for long life.

If, photographs are taken using film cameras then the images must be carefully stored in an album with each image properly marked for identification on backside right top corner. The album should be stored in a dry, cool place. It is recommended that the album should be placed in an air tight polythene bag alongwith some silica gels.

Similarly, negatives should be taken care to ensure better quality reprints. They need to be stored in an acid free negative sleeves (available commercially). Label them properly for future identification. It is very very important to care for negatives since; scanned images from your positives are not of good quality. At the same time they are not accepted for submission by various boards for their accreditation exams.

Digital images should be transferred to the computer using specifications given by the camera manufacturer. The transfer could be done with the use of USB cable or via memory card reader. Transfer all images to the computer hard drive. Set the internal clock of the computer to correct time.

Once, the images are transferred, 'rename' them properly and arrange them in sequential manner. *You must at the same time copy all the images in a compact disk or a DVD for safety reasons.* In addition also copy all the images to an external HDD (Fig. 10.1). Store the external HDD and CD/DVD in separate areas. If photographs are taken in a RAW format then use a RAW converting software and preferably store them in TIFF format which is a loss less format (no information from an image is lost while it is been modified and resaved). For preparing the prints these images should be



Fig. 10.1: External hard disk is a reliable storage media for storage of large number of photographs

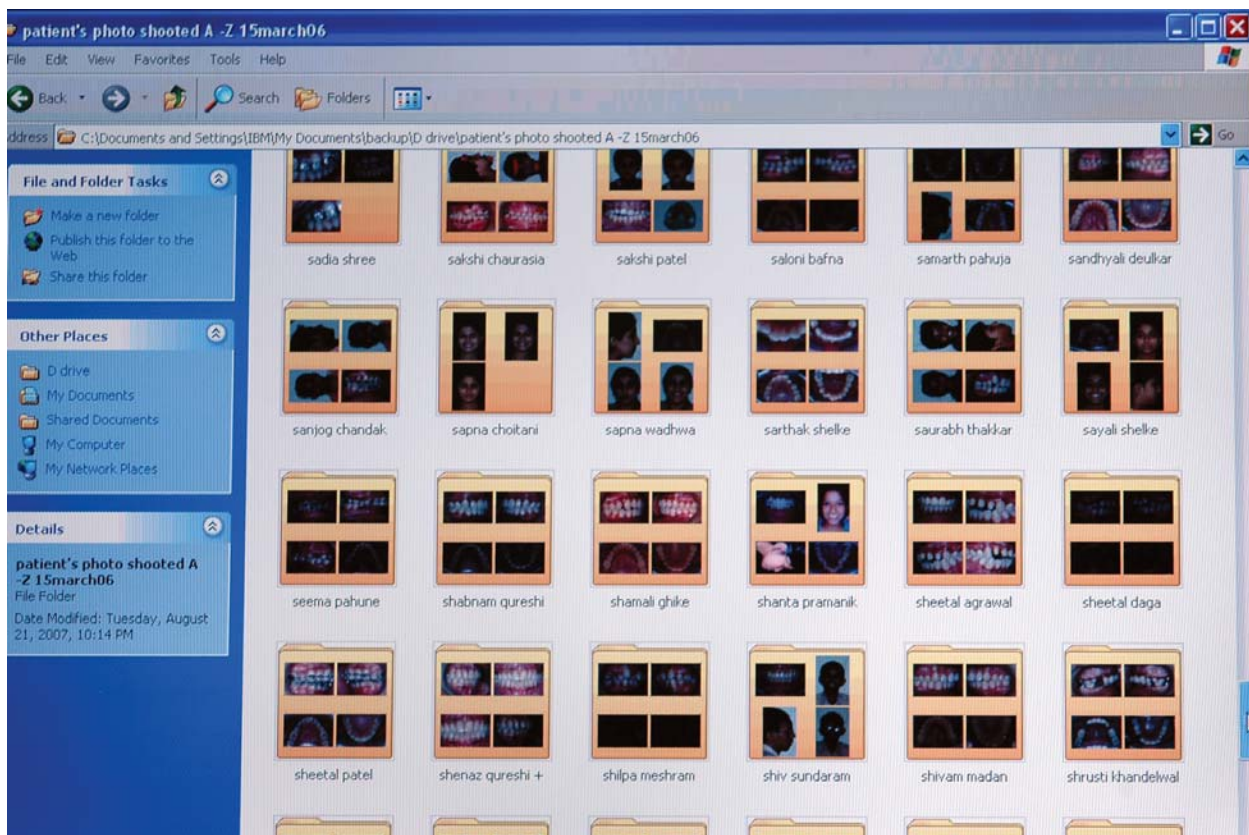


Fig. 10.2: Photographs should be stored in different folders and labeled for easy identification

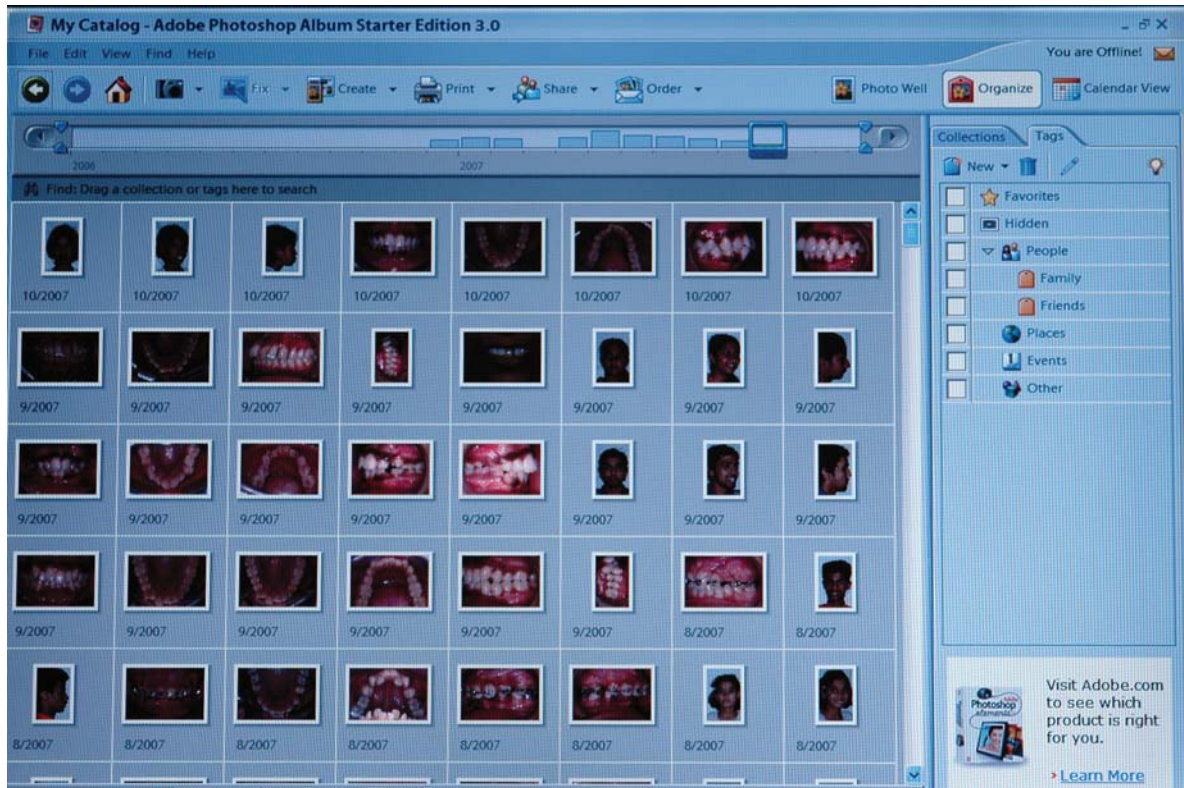


Fig. 10.3: Variety of softwares is available for organising the photographs in an effective way

copied in another folder and then converted to JPEG format at resolution of 300 dpi (JPEG is universal format used for printing of an image).

Many computer softwares are available for organising the collection of photographs. Use one of them as they are user friendly and help in easy retrieval of images in future (Figs 10.2 and 10.3).

Image Editing

Global Editing

Global editing is described as changes that are made across the entire image. Global editing of the images is an acceptable way to correct the color for camera bias, sharpness and tonal range only.

Focal, Fixed Point or Spot Editing

Focal, fixed point or spot editing is strictly prohibited in clinical dentistry and considered fraudulent. This means that even innocent changes such as cleaning up dust spots, cropping, rotating, resizing

or eliminating red eye is not acceptable. So, it is very essential to compose and shoot the photograph right in the first place.

Uphold the highest standards of ethical behavior desirable for profession of dentistry. As technology continually evolves, increasing opportunities exist for fraud. Any alteration of images, falsification of information or attempt to mislead the viewer is an unethical behavior.

It is highly recommended that negatives in case of film cameras should be preserved appropriately as they are the proof for authenticity. In digital images, the original file copied from camera should be stored safely either on DVD/CD or external HDD. If you wish to use these images for printing, power point presentation or exam purpose, then copy those images and use them. But in any case leave the original file as it is. The day is not far away when a specialized software will be available to detect manipulation of the digital images.



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